RSK Environmental Group

BROOKLYN: 3611 14TH AVE. Suite #551 Brooklyn NY 11218 QUEENS: 132-02 89TH AVE. Suite #222 Richmond Hill, NY 11418

August 8, 2022

NYS Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th floor,
Albany, NY 12233-7017
Attn: Ms. Meghan Medwid *(sent via email at meghan.medwid@dec.ny.gov)*

Re: Off-site Investigation Work Plan
Site: 1665 Stillwell Avenue, Brooklyn, NY 11223 (NYSDEC Site # C224307)

Dear Ms. Medwid,

This letter serves as an Off-site Investigation Work Plan to be conducted for the delineation of contaminants identified at the site located at 1665 Stillwell Avenue, Brooklyn, NY (hereafter referred to as "Site") as part of the Brownfield Cleanup Program (BCP) (NYSDEC Site #C224307). RSK Environmental Group, LLC (RSK) was retained by Sai Truong D.b.a. Refulgence LLC (hereafter referred to as "Client") on April 28, 2022, to perform an on-site Investigation as part of the BCP which requires off-site delineation of contaminants. This proposed Off-site Investigation Work Plan is consistent with the procedures defined in the NYSDEC's *Technical Guidance for Site Investigation and Remediation* (DER-10) and complies with all applicable standards, criteria, and guidance.

Kindly review the following work plan, and in case of any questions, please feel free to contact us at 718-436-5500 ext. 205.

Sincerely,

Drumita Dmello
Environmental Scientist

Danny Singh
Sr. Project Manager

TABLE OF CONTENS

FIGURES

APPENDICES

Site Background

The Site is located in the Gravesend neighborhood of Brooklyn, NY, and is identified as Block: 6618 and Lot: 48 (see site location map attached as **Figure 1**). The Site is a rectangular-shaped lot with an approximate area of 8,000-sq.ft., and is currently vacant with no structures. The Site is bound by Stillwell Avenue to the west, Kings Highway to the north, Quentin Road to the south and W 13th Street to the east. The Site is located in a residential district R6B with a commercial overlay zoning C2-3 that allows for commercial usage.

The Site was assigned an E-designation for "Hazardous Materials" (E-145) by the New York City Department of City Planning (NYCDCP) as part of the July 27, 2005, Bensonhurst Rezoning (CEQR 05DCP055K).

The Site was historically developed with a single-story concrete block building measuring 2,400-sq.ft. Per the Phase-I Environmental Site Assessment (Phase-I) Report prepared by American Environmental Assessment & Solutions, Inc. (AEAS) of Brooklyn, NY, the Site was historically utilized as a dairy (1970-1973, 1976), thrift shop (1985-1997), and drycleaner facility (1999 through 2014). Per the Google Street viewer, the drycleaner facility was operable till August 2018, and the building became vacant from June 2019 to October 2021.

Site Current Usage & Description

The Site is currently a vacant parcel of land with no onsite activities which is enclosed with 6-feet high wooden construction fence which encloses the four sides of the lot. The former building on the Site was demolished circa May 2021.

Proposed Redevelopment Plans

The proposed redevelopment plans include construction of a new five-story mixed use building with a cellar. The building foundation will be at a depth of 10 feet 4-inches. The footprint of the proposed building will be approximately 4,030-sq. ft. in size, and gross area of 15,905-sq. ft. The cellar will contain utilities, bicycle park, elevator shaft, and common area, the building will contain sixteen (16) units of residential housing on floors two through five and retail/commercial usage on the first floor. The eastern portion of the lot (rear section) will be utilized as parking, and the southern portion of the lot will be utilized as a driveway to access the rear yard.

Adjoining & Surrounding Properties Background

The surrounding adjoining properties consist of residential properties to the south and southwest, vacant commercial property to the north, and an institutional property (Brooklyn Public Library) to the east. Upon historic photo search from the Google Street viewer, the adjoining property to the north was utilized as Kings Highway Deli (operable until September 2014) and has been vacant since June 2018, adjoining properties to the northeast were utilized as a towing shop and an auto repair (operable from August 2011), where the auto repair shop has been vacant since August 2018. Surrounding properties within a ¼-mile radius consist of mainly residential, commercial and institutional properties/ See a copy of the surrounding land use map attached as **Figure 2**.

Scope of Off-site Investigation

The objective of this work plan is to investigate and characterize the nature and extent of the previously identified on-site contamination that may have migrated to the surrounding properties, per the Environmental Conservation Law (ECL) Article 27, Title 14 (Brownfield Cleanup Program). All remedial work performed under this plan will be in full compliance with governmental requirements, including site and worker safety requirements mandated by Federal OSHA as well as RSK's site-specific Health and Safety Plan (**Appendix A**). Modifications to this work plan will be made in consultation with, and under approval of, the NYSDEC. The sampling procedures of this investigation will be performed in accordance with DER-10.

The scope of the field investigation will include installation of nine (9) soil borings (SBO-1 through SBO-9) off-site which will focus on the perimeter of the block where the Site is situated. From the nine (9) soil borings, six (6) borings will be installed on the eastern and western sides of Stillwell Avenue, one (1) south of Kings Highway, one (1) north of Quentin Road, and one (1) west of W 13th Street (see a proposed soil boring location map attached as **Figure 3**). Two (2) sets of soil samples will be collected from each boring, i.e., a deepest dry sample and another at the soil and groundwater interface. At a minimum, a total of eighteen (18) discrete soil samples will be collected from nine (9) proposed borings. If visual contamination and/or high PID levels are observed, another set of a sample will be collected from the particular boring. All borings will be advanced deeper a depth of 25-feet to install groundwater monitoring wells in order to monitor groundwater conditions, and collect groundwater samples. Prior to installation of soil boings, appropriate permits will be acquired, and all utilities will be located and marked out. Each soil boring/well location will be identified utilizing GPS coordinates.

See the table below indicating the specifics of the proposed sampling plan for the Site:

Table 1: Location and Specification of Samples

Sample ID	Location of Sample	Media	Sample Depth	Number of Samples per Location	Total Number of Samples per Media	Analytical Method
OFF-SITE INVESTIGATION						
SBO-1 - SBO-3	West of Stillwell Avenue	Soil	• One deepest dry sample • One sample collected at soil and groundwater interface.	2 (3, if contamination encountered)	6 (up to 9, if contamination encountered)	EPA method 8260 for VOCs, 8270 for SVOCs, 8082A for PCBs, 8081B for Pesticides, 010C/7471B/9010C/7196A for TAL Metals (including Hexavalent & Trivalent Chromium and Cyanide), 8270 SIM for 1,4-Dioxane, and 537.1 for PFAS compounds.
SBO-4 - SBO-6	East of Stillwell Avenue	Soil	• One deepest dry sample • One sample collected at soil and groundwater interface.	2 (3, if contamination encountered)	6 (up to 9, if contamination encountered)	EPA method 8260 for VOCs, 8270 for SVOCs, 8082A for PCBs, 8081B for Pesticides, 010C/7471B/9010C/7196A for TAL Metals (including Hexavalent & Trivalent Chromium and Cyanide), 8270 SIM for 1,4-Dioxane, and 537.1 for PFAS compounds.

SB0-7 – SB0-9	One (1) north of Quentin Road, one (1) west of W 13th Street and one (1) south of Kings Highway	Soil	• One deepest dry sample • One sample collected at soil and groundwater interface.	2 (3, if contamination encountered)	6 (up to 9, if contamination encountered)	EPA method 8260 for VOCs, 8270 for SVOCs, 8082A for PCBs, 8081B for Pesticides, 010C/7471B/9010C/7196A for TAL Metals (including Hexavalent & Trivalent Chromium and Cyanide), 8270 SIM for 1,4-Dioxane, and 537.1 for PFAS compounds.
SBO-1/GWMW-1 through SBO-9/GWMW-9	Off-site Soil boring locations SBO-1 through SBO-9	Ground-water	1	1	9	EPA method 8260 for VOCs, 8270 for SVOCs, 8082A for PCBs, 8081B for Pesticides, 010C/7471B/9010C/7196A for TAL Metals – total and dissolved (including Hexavalent & Trivalent Chromium and Cyanide), 8270 SIM for 1,4-Dioxane, and 537.1 for PFAS compounds.

Soil Investigation

A geologist/engineer/QEP will screen the soil samples during borehole advancement for organic vapors with a photo-ionization detector (PID) and evaluated for visual and olfactory impacts prior to collecting environmental samples. All field work will be recorded in a field log. A drilling rig capable of advancing a borehole using direct push drilling methods via a Geoprobe® track-mounted drill rig equipped with a concrete core barrel or similar method i.e., portable coring machine together with hand-driven augers with appropriate tooling will be used and if necessary, more advanced drilling technology will be used to complete the off-site investigation. Sample locations SBO-1 through SBO-9 will be installed continuously every 5-feet from site grade on the pre-determined locations where two (2) sets of soil samples will be collected from each boring, i.e., a deepest dry sample and another at the soil and groundwater interface.

Groundwater Investigation

A total of nine (9) groundwater samples will be collected from the off-site soil boring locations SBO-1 through SBO-9 which will be converted into permanent Groundwater Monitoring Wells SBO-1/GWMW-1 through SBO-9/GWMW-9 for groundwater sampling. Sampling will be conducted in accordance with DER-10. Nine (9) 2-inch diameter permanent groundwater monitoring wells will be installed on the pre-determined off-site locations. The newly installed monitoring wells will be developed no sooner than 24 hours after construction has been completed.

Representative groundwater samples will be collected using low-flow sampling techniques. Properly sized screen and silica sand pack will be used for noted Site conditions. A representative groundwater sample will be collected from each well with a peristaltic pump and dedicated tubing. Groundwater wells will be gauged with a water level meter to record a depth to groundwater reading (1/100 foot), and if necessary, an interface meter to determine the thickness of LNAPL or DNAPL. The well casings will be surveyed by a trained QEP and/or NYS licensed surveyor to facilitate preparation of a groundwater contour map and determine the direction of groundwater flow.

Sample Analysis

Soil and groundwater samples collected will be submitted to a NYSDOH Environmental Laboratory Accreditation Program (ELAP)-certified laboratory for full analysis.

Soil and groundwater samples will be analyzed using:

- Volatile Organic Compounds by EPA Method 8260;
- Semi-volatile Organic Compounds by EPA method 8270;
- Pesticides/PCBs by EPA Method 8081/8082
- 6010C/7471B/9010C/7196A for TAL Metals (including Hexavalent & Trivalent Chromium and Cyanide) (All Groundwater samples will be analyzed for both filtered (dissolved) and unfiltered (total) metals).

In addition, all soil samples and groundwater samples will also be analyzed for PFAS (NYSDC Analyte List) by LC-MS/MS via EPA 537.1 and 1,4-Dioxane via EPA Method 8270 SIM. Sampling will be performed in accordance with the *NYSDEC Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substance (PFAS), dated October 2020*

Investigation Derived Waste

Investigation derived waste (IDW) generated during off-site investigation will generally include contaminated soil cuttings, purged groundwater and miscellaneous disposable sampling equipment and PPE. Soil cuttings that do not exhibit visual or olfactory evidence of contamination may be used to backfill boring holes. Excess soil cuttings or cuttings exhibiting staining, odor or PID readings generated will be stored in 55-gallon drums equipped with tight fitting lids and staged at the Site located at 1665 Stillwell Avenue, which will be labeled appropriately. Drummed soil will be characterized for disposal and transported to a permitted facility pursuant to all federal state and local regulations. All drums containing soil cuttings or groundwater will be labeled to indicate their contents.

Development and purged groundwater generated during investigation activities will be stored in 55-gallon drums equipped with tight fitting lids and staged at the Site located at 1665 Stillwell Avenue, which will be labeled appropriately. Purged groundwater will be characterized for disposal and transported to a permitted facility pursuant to all federal state and local regulations. Transportation manifests and disposal facility weight tickets for all IDW generated investigation activities will be provided to NYSDEC.

Disposal sampling equipment such as macro core liners, spoons, gloves, paper towels may be double bagged and disposed of as municipal trash as non-hazardous refuse.

Quality Assurance Project Plan

This section discusses the quality assurance procedures that will be followed during sample collection and analysis.

Field Activities

As illustrated in **Figure 3**, up to nine (9) boreholes will be installed on the pre-determined off-site locations. The performance of several of these borings and the collection of samples is contingent on the field observations and PID reading obtained from the initial borings. All boreholes will be converted to monitoring wells and sampled to delineate the extent of the contamination off-site from the historic on-site dry-cleaner facility.

Soil Sampling: Samples will be managed by field personnel wearing the proper PPE to eliminate the potential for cross-contamination. The samples will be transferred into laboratory-provided containers and sent to the laboratory as soon as practicable, but no later than 48 hours after sample collection, under standard chain-of custody procedures. The collection of environmental samples during the investigation will adhere to the appropriate sampling methods, sample preservation requirements, sample holding times, and decontamination procedure for field equipment.

Monitoring Well Installation: Nine (9) permanent groundwater monitoring wells (SBO-1/GWMW-1 through SBO-9/GWMW-9) will be installed on the pre-determined off-site locations (**Figure 4**). The monitoring well will consist of 2-inch diameter 10-foot long Schedule 40 PVC soiled riser, and machine slotted 2-inch diameter PVC screen (0.01-inch slot size). Recovered samples will be examined by qualified RSK personnel and characterized in accordance with ASTM Method D2488, Standard Practice for description and Identification of Soils (visual-Manual Procedure), scanned for total VOCs with a calibrated PID equipped with 10.6eV lamp (or equivalent), and characterized for impacts via visual and/or olfactory observations. All non-dedicated drilling tools and equipment will be decontaminated between boring location using potable tap water and a phosphate-free detergent.

Subsequent to boring completion, each monitoring well will be constructed of 2-inch diameter Schedule 40 PVC soiled riser, and machine slotted 2-inch diameter PVC screen (0.01-inch slot size). The monitoring well screen will be approximately 10-feet in length and the riser will be 15-feet in length. The well annulus around the screen will be backfilled with clean sand to about 2-feet above the top of the well screen. A bentonite seal (minimum 2-feet thick) will be installed immediately above the sand layer. The bentonite seal will be constructed with 3/8-inch bentonite pellets or medium bentonite chips and allowed to hydrate sufficiently to mitigate the potential for down-hole grout contamination. The top of the well riser pipe will be fitted with a lockable J-plug and secured flush to existing grade surface with an 8-inch steel manhole road box.

Provided that each of the wells yields sufficient water, groundwater samples will be collected from each of the wells using low flow sampling methods. The total depth of the wells is expected to be within 25-feet of the ground surface.

Well Development: The newly installed monitoring wells will be developed no sooner than 24-hours after construction has been completed. The development procedure will require purging of the groundwater and periodically surging the water in the well to loosen and remove suspended fines from the well screen and sand pack. Measurements of the water volume removed, and water quality parameters will be recorded at regular intervals through the development process. Development will continue until water quality measurements stabilize to within 10 percent of the previous measurement.

Monitoring Well Sampling: Groundwater will be collected from each well using low flow sampling techniques (typically less than 0.1 L/min) via dedicated plastic flex tubing and a peristaltic pump. If low-flow sampling is not feasible due to insufficient groundwater recharge rates, new and dedicated disposable bailers may be used to collect the groundwater samples. If sufficient groundwater volume is available, each well will be sampled for full suite analysis, and for emerging contaminants.

Field measurements for groundwater level as well as visual and olfactory field observations will be periodically recorded and monitored during well purging prior to sampling. Purging will be considered complete when water stabilizes between 10 percent of field measurements. The collection of groundwater samples during the investigation will adhere to the appropriate sampling methods, sample preservation requirements, sample holding times, and decontamination procedure for field equipment.

Equipment Calibration: The PID used during the investigation will be calibrated before use and checked in the field with isobutylene at the beginning of the day to 100 parts per million (ppm). If a reading is suspect, the PID's response will be rechecked, and if necessary, recalibrated. Prior to groundwater sampling, the equipment and instruments will be checked to ensure they are working properly. The groundwater quality meters will be calibrated using the EPA's Calibration of Field Instruments (temperature, pH, dissolved oxygen, conductivity/specific conductance, oxidation/reduction [ORP], and turbidity), March 23, 2017, or latest version or from one of the methods listed in 40CFR136, 40CFR141 and SW-846.

Equipment Decontamination: Re-usable equipment employed during the investigation will undergo decontamination procedures to reduce the potential for cross-contamination. Between each borehole, the sampling equipment will be rinsed with an Alconox soap and deionized water solution, wiped clean with paper towels, and then rinsed with deionized water.

Quality Assurance/Quality Control

QA/QC Procedure: QA/QC procedures will be used to provide performance information with regard to accuracy, precision, sensitivity, representation, completeness, and compatibility associated with the sampling and analysis for this investigation. Field QA/QC procedures will be used (1) to document that samples are representative of actual conditions at the Site and (2) identify possible cross-contamination from field activities or sample transit. Laboratory QA/QC procedures and analyses will be used to demonstrate whether analytical results have been biased either by interfering compounds in the sample matrix, or by laboratory techniques that may have introduced systematic or random errors to the analytical process. QA/QC samples will be collected during the sampling events:

- Field duplicates at a frequency of 1 per 20 samples for each matrix sampled;
- Matrix spikes/ matrix spike duplicates at a frequency of 1 per 20 samples for each matrix sampled;
- Equipment blanks one per day for each matrix sampled;
- Field blanks one per day when PFAS samples are collected;
- Trip blanks one per day.

Field QA/QC: Field QA/QC will include the following procedures:

- Calibration of field equipment, including PID, on a daily basis.
- Use of dedicated and/or disposable field sampling equipment.
- Proper sample handling and preservation.
- Proper sample chain of custody documentation; and

- Completion of report logs.

The above procedures will be executed as follows:

- Disposable sampling equipment, including acetate sleeves, latex gloves, and disposable bailers (or sample tubing), will be used to minimize cross-contamination between samples.
- For each of the parameters analyzed, a sufficient sample volume will be collected to adhere to the specific analytical protocol, and provide sufficient sample for reanalysis if necessary.
- Because plasticizers and other organic compounds inherent in plastic containers may contaminate samples requiring organic analysis, samples will be collected in glass containers, with the exception of the nitrate-preserved groundwater sample for metals analysis.
- Appropriate sample preservation techniques, including cold temperature storage at 4° C, will be utilized to ensure that the analytical parameters concentrations do not change between the time of sample collection and analysis: and
- Samples will be analyzed prior to the expiration of the respective holding time for each analytical parameter to ensure the integrity of the analytical results.

Sample Custody: Sample handling in the field will conform to appropriate sample custody procedures. Field custody procedures include proper sample identification, chain-of-custody forms, and packaging and shipping procedures. Sample labels will be attached to all sampling bottles before field activities begin to ensure proper sample identification. Each label will identify the site and sample location. Styrofoam or bubble wrap will be used to absorb shock and prevent breakage of sample containers. Ice or ice packs will be placed in between the plastic bags for sample preservation purposes.

After each sample is collected and appropriately identified, the following information will be entered into the chain-of-custody form:

- Site name and address.
- Sampler(s)' name(s) and signature(s).
- Names and signatures of persons involved in the chain of possession of samples.
- Sample number.
- Number of containers.
- Sample location.
- Date and time of collection.
- Type of sample, sample matrix and analyses requested.
- Preservation used (if any); and
- Any pertinent field data collected (pH, temperature, conductivity, Dissolved Oxygen [DO])

The sampler will sign and date the "Relinquished" blank space prior to removing one copy of the custody form and sealing the remaining copies of the form, in a Ziploc plastic bag taped to the underside of the sample cooler lid. The sample will be sealed with tape prior to delivery or shipment to laboratory.

Report Logs: Field logs and boring logs will be completed during the course of this investigation. A field log will be completed on a daily basis which will describe all field activities including:

- Project number, name, manager, and address.
- The date and time.
- The weather conditions.
- On-site personnel and associated affiliations.
- Description of field activities; and
- Pertinent sample collection information including sample identification numbers, description of samples, location of sampling points, number of samples taken, method of sample collection, and any factors that may affect its quality, time of sample collection, name of collector, and field screening results.

A boring log will be completed for each boring and will include the following information:

- Project number, name, manager, and location.
- The date and time.
- Drilling company and method used.
- Boring number.
- Total boring depth and water table depths; and
- Pertinent soil sample information including sample number, interval, depth, amount recovered, color, composition, percent moisture, visual and olfactory observations of contamination, and PID readings.

Laboratory QA/QC: An ELAP-certified laboratory will be used for all sample analyses. All samples will be delivered to the laboratory within 24 hours of sample collection. Samples will be received by laboratory personnel, who will inspect the sample cooler(s) to check the integrity of the custody seals. The cooler(s) will then be opened, the samples unpackaged, and the information on the chain-of-custody form examined. If the shipped samples match those described on the chain-of-custody form, the laboratory custodian will sign the form and record problems in the "Remarks" box. The custodian will then immediately notify the Project Manager so appropriate follow-up steps can be implemented on a timely basis.

A record of the information detailing the handling of a particular sample through each stage of analysis will be maintained by the laboratory. The record will include:

- Job reference, sample matrix, sample number, and date sampled.
- Date and time received by laboratory, holding conditions, and analytical parameters.
- Extraction date, time, and extractor's initials (if applicable), analysis date, time, and analyst's initials; and

QA batch number, date reviewed, and reviewer's initials.

Off-site Investigation Report (OIR)

Upon completion of the off-site investigation and receipt of analytical results, an Off-site Investigation Report (OIR) will be prepared that will summarize the activities completed during the work performed. Soil analytical results will be compared to the NYSDEC Part 375-6.8(a) Unrestricted Use Soil Cleanup Objectives, and appropriate Part 375-

6.8(b) Restricted Soil Cleanup Objectives. Groundwater analytical results will be compared to NYSDEC Part 703 Groundwater Quality Standards (GQS) (class GA) or Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (AWQS). All data will be submitted as Electronic Data Deliverables (EDDs) to NYSDEC for inclusion in the State's EquIS database.

The report will summarize all applicable documentation during the field activities completed (site map, soil boring and groundwater monitoring well construction logs, and sampling intervals) during the investigation and will include an updated sampling plans, spider diagrams, analytical data tables for all reported constituent compounds (including non-detectable concentrations), as well as Data Usability Summary Reports (DUSRs) and laboratory data packages. The report will also include all sampling logs and photos taken during the investigation.

Community Air Monitoring

In accordance with DER-10 requirements for remedial investigation, a Community Air Monitoring Plan (CAMP) is required for the investigation work; however, due to the extent of the offsite soil borings placement, appropriate measures will be taken to conduct community air monitoring during investigative work and in the event elevated PID readings or samples depicting contamination. The CAMP is included in **Appendix B**.

Citizen Participation

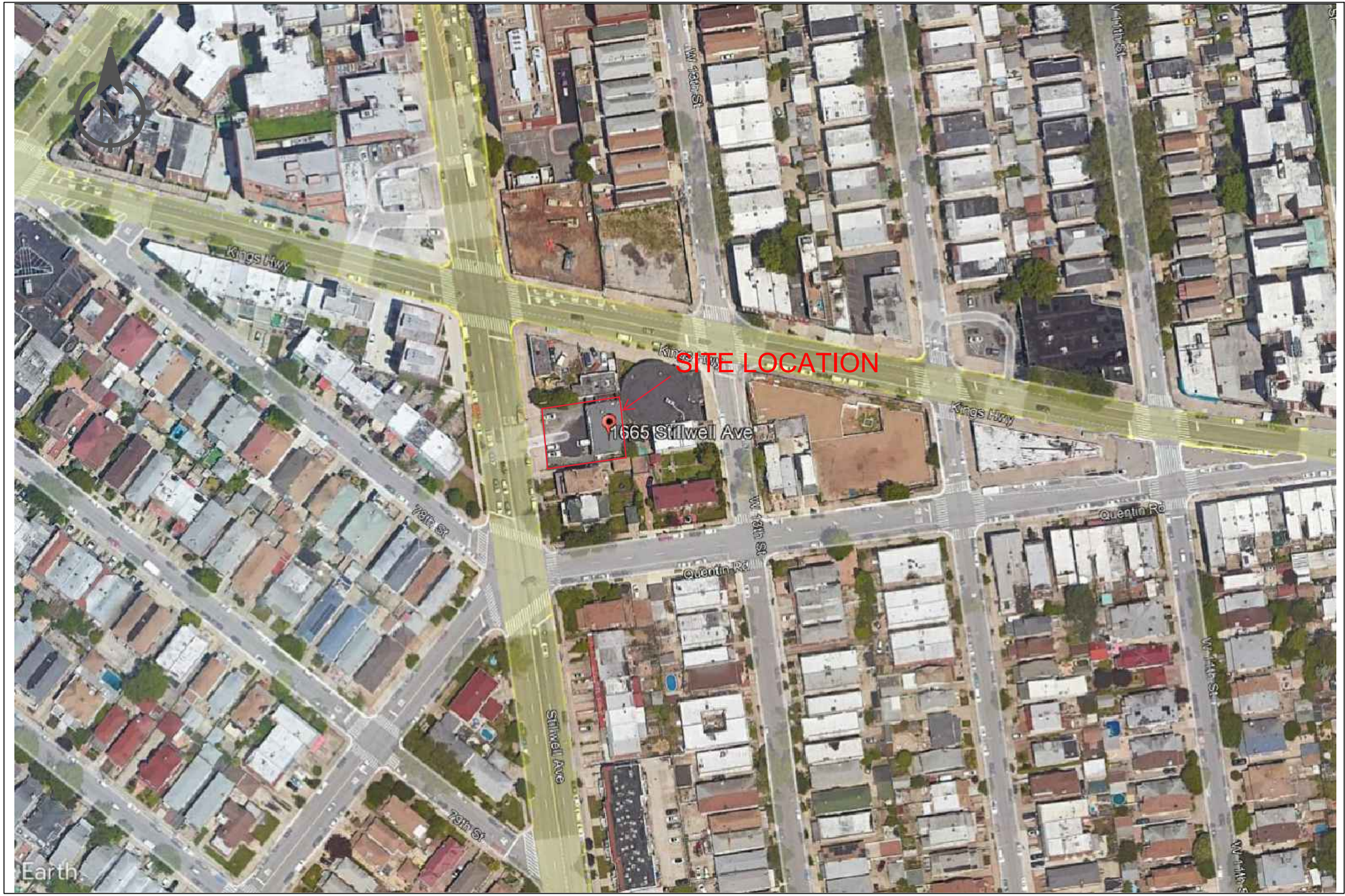
Citizen participation activities will be performed throughout the RI process to involve and inform the public. The specific citizen participation activities to be performed are outlined in the Citizen Participation Plan (CPP) included as **Appendix C** .

PROJECT SCHEDULE

The project schedule has been updated to reflect completed tasks and events as of August 2022 as shown below:

TASK	TIMELINE
Work Plan DEC Review Period	30-days
Mobilization to implement off-site investigation	1 week from work plan approval
Submit the Off-site Investigation Report (OIR) for DEC approval	Within 6-8 weeks of receiving analytical data from lab

Figures



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REVISION DATA:

REV	DATE	COMMENT	BY

SCALE (FEET):

AS NOTED:

PROJECT NAME:

1665 STILLWELL AVE, BROOKLYN, NY, 11223

DRAWING TITLE:

FIGURE 1: SAMPLING LOCATION PLAN

SEAL & SIGNATURE:	DRAWING DATA:
	DATE: 6/1/2022 PROJECT NO: DRAWING BY: BM CHECK BY: DS

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REVISION DATA:

REV	DATE	COMMENT	BY

SCALE:

NOT TO SCALE

PROJECT NAME:

1665 STILLWELL AVENUE
BROOKLYN, NY 11223
BLOCK: 6618, LOT: 48

DRAWING TITLE:

FIGURE 2. SURROUNDING LAND USAGE

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PROJECT NO: 1665/ESM
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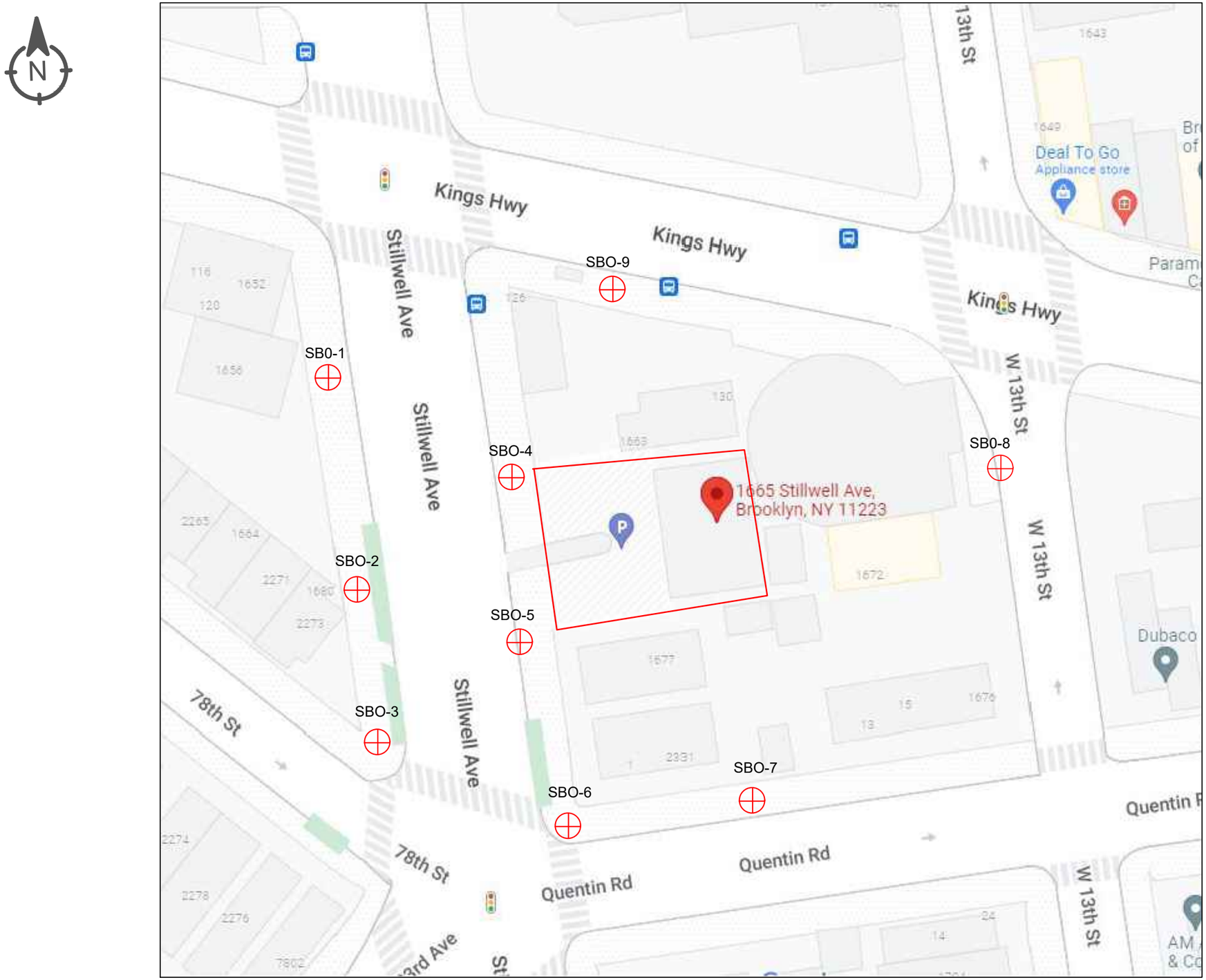

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REV	DATE	COMMENT	BY

SCALE:

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PROJECT NAME:

1665 STILLWELL AVENUE
BROOKLYN, NY 11223
BLOCK: 6618, LOT: 48

DRAWING TITLE:

FIGURE 3 - OFF-SITE SOIL BORING LOCATION MAP

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PROJECT NO: 1665/ESM
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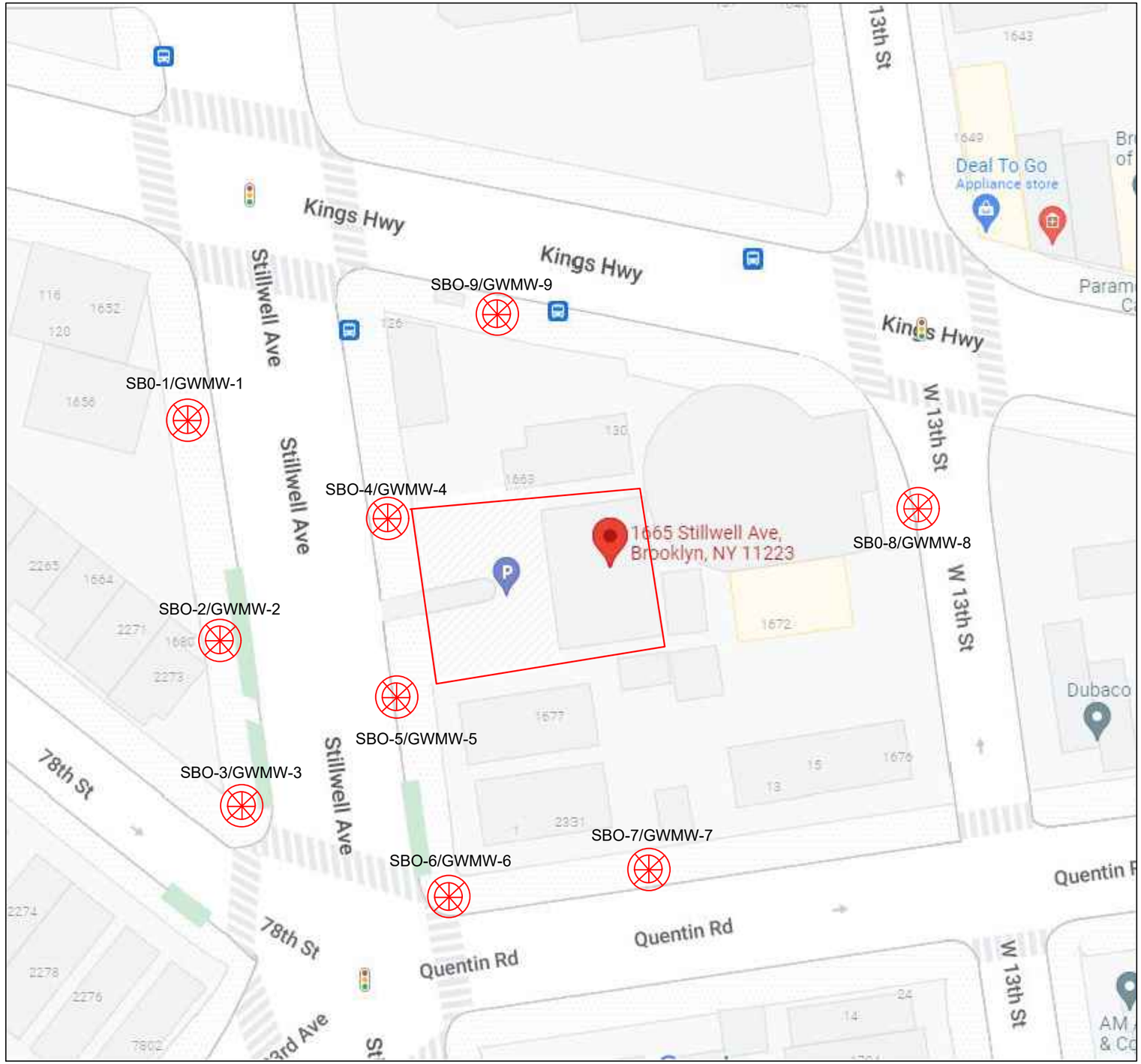
CAD FILE NO.:



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PROJECT NAME:

1665 STILLWELL AVENUE
BROOKLYN, NY 11223
BLOCK: 6618, LOT: 48

DRAWING TITLE:

FIGURE 4 - OFF-SITE GROUNDWATER SAMPLE LOCATION MAP

SEAL & SIGNATURE:

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DATE: 08/05/2022
PROJECT NO: 1665/ESM
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CHECK BY: DS

DRAWING NO.:

CAD FILE NO.:

Appendix A

SITE SPECIFIC HEALTH AND SAFETY PLAN (HASP)

RSK Environmental Group

BROOKLYN: 3611 14TH AVE. Suite #551 Brooklyn NY 11218 QUEENS: 132-02 89TH AVE. Suite #222 Richmond Hill, NY 11418

HEALTH AND SAFETY PLAN (HASP)

Block # 6618
Stillwell Avenue, Kings Highway, W 13th Street and Quentin Road
Brooklyn, NY 11223

Prepared for:
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway,
Albany, NY 12233

Prepared by:
RSK Environmental Group, LLC
132-02 89th Avenue, Suite 222
Richmond Hill, NY 11418

August 2022

SITE-SPECIFIC HEALTH AND SAFETY PLAN

Client:	**Refulgence LLC**
Site Address:	**Block 6618 (Stillwell Avenue, Kings Highway, W 13th Street and Quentin Road)**
Date Prepared:	**August 8, 2022**
Project Description:	**Off-site Subsurface Investigation**

RSK ENVIRONMENTAL GROUP, LLC AND ITS SUBCONTRACTORS DO NOT GUARANTEE THE HEALTH OR SAFETY OF ANY PERSON ENTERING THIS SITE. DUE TO THE NATURE OF THIS SITE AND THE ACTIVITY OCCURRING THEREON, IT IS NOT POSSIBLE TO DISCOVER, EVALUATE, AND PROVIDE PROTECTION FOR ALL POSSIBLE HAZARDS WHICH MAY BE ENCOUNTERED. STRICT ADHERENCE TO THIS HEALTH AND SAFETY GUIDELINES SET FORTH HEREIN WILL HELP REDUCE, BUT NOT ELIMINATE, THE POTENTIAL FOR ANY INJURY AT THIS SITE. THE HEALTH AND SAFETY GUIDELINES IN THIS PLAN WERE PREPARED SPECIFICALLY FOR THIS SITE AND SHOULD NOT BE USED ON ANY OTHER SITE(S) WITHOUT PRIOR RESEARCH AND EVALUATION.

HEALTH AND SAFETY PLAN

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STATEMENT OF COMMITMENT

This Health and Safety Plan (HASP) has been prepared to ensure that workers are not exposed to risks from hazardous materials during any investigative activities planned specifically for the off-site location around **Block 6618, along Stillwell Avenue, Kings Highway, W 13th Street and Quentin Road** (off-site location). This HASP, which applies to persons present during off-site investigation, actually or potentially exposed to hazardous materials, describes emergency response procedures for actual and potential chemical hazards. This HASP is also intended to inform and guide personnel entering the work area or exclusion zone. Persons are to acknowledge that they understand the potential hazards and the contents of this Health and Safety policy by signing off on receipt of their individual copy of the document. The subcontractors are retained as independent contractors and are responsible for ensuring the health and safety of their own employees. The subcontractor has the option of adopting this HASP or providing its own for the planned scope of work.

1.1 INTRODUCTION

The Purpose and Policy of this Health and Safety Plan (HASP) has been developed to comply with the regulations under 26 CFR 1926, Construction, Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER), and COVID-19 Control and Prevention. It addresses safety and health hazards related to subsurface sample collection activities and is based on the best information available with the off-site work activities to be conducted on the perimeter of Block 6618, along Stillwell Avenue, Kings Highway, W 13th Street and Quentin Road (off-site). This document describes the health and safety guidelines developed by RSK Environmental Group, LLC (RSK) for the implementation of off-site investigation for delineating the contaminants identified on the Site located at 1665 Stillwell Avenue, Brooklyn, NY, to protect the personnel, visitors, and the public from physical harm and exposure to hazardous materials or wastes during the subsurface investigation activities. The HASP may be revised by RSK at the request of the New York State Department of Environmental Conservation (NYSDEC) upon receipt of new information regarding site conditions. Changes will be documented by written amendments signed by RSK's Project Manager, Site Safety Officer and/or the RSK Health and Safety Consultant.

1.1 Scope

This HASP addresses the potential hazards related to the possible contamination migration from the Site which was historically utilized as a dry-cleaning facility from 1999 operable till August 2018. The RIWP activities are as described below:

1. The scope of the field investigation will include installation of nine (9) soil borings (SBO-1 through SBO-9) off-site which will focus on the perimeter of the block where the Site is situated. From the nine (9) soil borings, six (6) borings will be installed on the eastern and western sides of Stillwell Avenue, one (1) south of Kings Highway, one (1) north of Quentin Road, and one (1) west of W 13th Street. Two (2) sets of soil samples will be collected from each boring, i.e., a deepest dry sample and another at the soil and groundwater interface. At a minimum, a total of eighteen (18) discrete soil samples will be collected from nine (9) proposed borings. If visual contamination and/or high PID levels are observed, another set of a sample will be collected from the particular boring.

2. All borings will be advanced deeper a depth of 25-feet to install groundwater monitoring wells in order to monitor groundwater conditions, and collect groundwater samples.

1.2 Application

This HASP applies to all personnel involved in the above tasks who wish to gain access into the active work areas on off-site locations, including but not limited to:

- RSK employees and subcontractors;
- Client representatives; and
- Federal, state or local representatives.

1.3 Safety Plan Acceptance, Acknowledgment and Amendments

The safety officer is responsible for informing personnel (RSK employees and/or owner or owner's representatives) entering the work area of the contents of this plan and ensuring that each person signs the safety plan acknowledging the off-site hazards and procedures required to minimize exposure to adverse effects of these hazards. A copy of the Acknowledgement Form is included in **Appendix A**.

Off-site conditions may warrant an amendment to this HASP. Amendments to this HASP are acknowledged by completing forms included in **Appendix B**.

1.4 Key Personnel - Roles and Responsibilities

Personnel responsible for implementing this Health and Safety Plan are:

Name	Company/Title	Address	Contact Numbers
Jazlyn Natalie	RSK Environmental Project Manager	132-02 89th Avenue Ste. #222 Richmond Hill, NY 11418	(718) 438-2200, Ext. 206 (347) 345-9075
Drumita Dmello	RSK Environmental Site Safety Officer	132-02 89th Avenue Ste. #222 Richmond Hill, NY 11418	(718) 438-2200, Ext. 205 (646) 249-6129
Bradley Moore	RSK Environmental Field Geologist	132-02 89th Avenue Ste. #222 Richmond Hill, NY 11418	(718) 438-2200, Ext. 207 (770) 331-7595
Dhanraj Singh	RSK Environmental Sr. Project Manager	132-02 89th Avenue Ste. #222 Richmond Hill, NY 11418	(718) 438-2200, Ext. 202 (347) 728-0768
Ted Yen, P.E.	Ted Yen & Associates, P.E.	217-42 54th Avenue, Bayside Hills, NY 11364	(917) 584-6299

The project manager is responsible for overall project administration and, with guidance from the site safety officer, for supervising the implementation of this HASP. The site safety officer will conduct daily (tail gate or toolbox) safety meetings at the site and oversee daily safety issues. Each subcontractor and supplier (defined as an OSHA employer) is also responsible for the health and safety of its employees. If there is any dispute about health and safety or project activities, the personnel will attempt to resolve the issue. If the issue cannot be resolved at the site, then the project manager will be consulted.

The site safety officer is also responsible for coordinating health and safety activities related to hazardous material exposure off-site. The safety officer is responsible for the following:

1. Educating personnel about information in this HASP and other safety requirements to be observed during off-site operations, including, but not limited to, decontamination procedures, designation of work zones and levels of protection, air monitoring, fit testing, and emergency procedures dealing with fire and first aid.
2. Coordinating site safety decisions with the project manager.
3. Designating exclusion, decontamination and support zones on a daily basis.
4. Monitoring the condition and status of known on-site hazards and maintaining and implementing the air quality monitoring program specified in this HASP.
5. Maintaining the work zone entry/exit log and site entry/exit log.
6. Maintaining records of safety problems, corrective measures and documentation of chemical exposures or physical injuries (the safety officer will document these conditions in a bound notebook and maintain a copy of the notebook). The person who observes safety concerns and potential hazards that have not been addressed in the daily safety meetings should immediately report their observations/concerns to the safety officer or appropriate key personnel.

2.0 Background of surrounding and adjoining properties

The surrounding adjoining properties consist of residential properties to the south and southwest, vacant commercial property to the north, and an institutional property (Brooklyn Public Library) to the east. Upon historic photo search from the Google Street viewer, the adjoining property to the north was utilized as Kings Highway Deli (operable until September 2014) and has been vacant since June 2018, adjoining properties to the northeast were utilized as a towing shop and an auto repair (operable from August 2011), where the auto repair shop has been vacant since August 2018. Surrounding properties within a ¼-mile radius consist of mainly residential, commercial and institutional properties.

2.1 Scope of Work

The objective of this work plan is to investigate and characterize the nature and extent of the previously identified on-site contamination that may have migrated to the surrounding properties, per the Environmental Conservation Law (ECL) Article 27, Title 14 (Brownfield Cleanup Program). All remedial work performed under this plan will be in full compliance with governmental requirements, including site and worker safety requirements mandated by Federal OSHA as well as RSK's Health and Safety Plan. The sampling procedures of this investigation will be performed in accordance with DER-10.

The scope of the field investigation will include installation of nine (9) soil borings (SBO-1 through SBO-9) off-site which will focus on the perimeter of the block where the Site is situated. From the nine (9) soil borings, six (6) borings will be installed on the eastern and western sides of Stillwell Avenue, one (1) south of Kings Highway, one (1) north of Quentin Road, and one (1) west of W 13th Street. Two (2) sets of soil samples will be collected from each boring, i.e., a deepest dry sample and another at the soil and groundwater interface. At a minimum, a total of eighteen (18) discrete soil samples will be collected from nine (9) proposed borings. If visual contamination and/or high PID levels are observed, another set of a sample will be collected from the particular boring. All borings will be advanced deeper a depth of 25-feet to install groundwater monitoring wells in order to monitor groundwater conditions, and collect groundwater samples. Prior to installation of soil boings, appropriate permits will be acquired, and all utilities will be located and marked out. Each soil boring/well location will be identified utilizing GPS coordinates.

3.0 HAZARD ASSESSMENT

This section identifies the hazards associated with the proposed scope of work, general physical hazards that can be expected at most sites; and presents a summary of documented or potential chemical hazards at the site. Every effort must be made to reduce or eliminate these hazards. Those that cannot be eliminated must be guarded against using engineering controls and/or personal protective equipment.

3.1 Physical Hazards

3.1.1 Tripping Hazards
An area of risk associated with off-site activities are presented by uneven ground, concrete, curbstones or equipment which may be present at the site thereby creating a potential tripping hazard. During intrusive work, care should be taken to mark or remove any obstacles within the exclusion zone.

3.1.2 Climbing Hazards
During site activities, workers may have to work on drilling equipment by climbing. The drilling contractor will conform with any applicable NIOSH and OSHA requirements or climbing activities.

3.1.3 Cuts and Lacerations
Field activities that involve drilling activities usually involve contact with certain technical drilling machinery and tooling. A first aid kit approved by the American Red Cross will be available during all intrusive activities.

3.1.4 Lifting Hazards
Improper lifting by workers is one of the leading causes of industrial injuries. Field workers in the drilling program may be required to lift heavy objects. Therefore, all members of the field crew should be trained in the proper methods of lifting heavy objects. All workers should be cautioned against lifting objects too heavy for one person.

3.1.5 Utility Hazards
Before conducting any drilling, the drilling contractor will be responsible for locating and verifying all existing utilities at each boring location.

3.1.6 Traffic Hazards
All traffic, vehicular and pedestrian, shall be maintained and protected at all times consistent with local, state and federal agency regulations regarding such traffic and in accordance with DOT guidelines. The drilling contractor shall carry on his operations without undue interference or delays to traffic. The drilling contractor shall furnish all labor, materials, guards, barricades, signs, lights, and anything else necessary to maintain traffic and to protect his work and the public, during operations.

3.2 Work in Extreme Temperatures

Work under extremely hot or cold weather conditions requires special protocols to minimize the chance that employees will be affected by heat or cold stress.

3.2.1 Heat Stress
The combination of high ambient temperature, high humidity, physical exertion, and personal protective apparel, which limits the dissipation of body heat and moisture, can cause heat stress. The following prevention, recognition and treatment strategies will be implemented to protect personnel from heat stress. Personnel will be trained to recognize the symptoms of heat stress and to apply the appropriate treatment.

1. Prevention
   a. Provide plenty of fluids. Available in the support zone will be a 50% solution of fruit punch and water or plain water.
   b. Work in Pairs. Individuals should avoid undertaking any activity alone.
   c. Provide cooling devices. A spray hose and a source of water will be provided to reduce body temperature, cool protective clothing and/or act as a quick-drench shower in case of an exposure incident.
   d. Adjustment of the work schedule. As is practical, the most labor-intensive tasks should be carried out during the coolest part of the day.

2. Recognition and Treatment
   a. Heat Rash (or prickly heat):
      Cause: Continuous exposure to hot and humid air, aggravated by chafing clothing.
      Symptoms: Eruption of red pimples around sweat ducts accompanied by intense itching and tingling.
      Treatment: Remove source of irritation and cool skin with water or wet cloths.

   b. Heat Cramps (or heat prostration)
      Cause: Profuse perspiration accompanied by inadequate replenishment of body water and electrolytes.
      Symptoms: Muscular weakness, staggering gait, nausea, dizziness, shallow breathing, pale and clammy skin, approximately normal body temperature.
      Treatment: Perform the following while making arrangement for transport to a medical facility. Remove the worker to a contamination reduction zone. Remove protective clothing. Lie worker down on back in a cool place and raise feet 6 to 12 inches. Keep warm but loosen all clothing. If conscious, provide sips of salt-water solution, using one teaspoon of salt in 12 ounces of water. Transport to a medical facility.

   c. Heat Stroke
      Cause: Same as heat exhaustion. This is also an extremely serious condition.
      Symptoms: Dry hot skin, dry mouth, dizziness, nausea, headache, rapid pulse.
      Treatment: Cool worker immediately by immersing or spraying with cool water or sponge bare skin after removing protective clothing. Transport to hospital.

3.2.2 Cold Exposure

Exposure to cold weather, wet conditions and extreme wind-chill factors may results in excessive loss of body heat (hypothermia) and/or frostbite. To guard against cold exposure and to prevent cold injuries, appropriate warm clothing should be worn, warm shelter must be readily available, rest periods should be adjusted as needed, and the physical conditions of field personnel should be closely monitored. Personnel and supervisors working off-site will be made aware of the signs and symptoms of frostbite and hypothermia such as shivering, reduced blood pressure, reduced coordination, drowsiness, impaired judgment, fatigue, pupils dilated due to light and numbing of the toes and fingers.

3.3 Chemical Hazards

Chemical hazards will be full list of Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), Pesticides/PCBs, Target Analyte List Metals, 1,4-Dioxane and Perfluoroalkyl Substances (PFAS). The primary routes of exposure to the identified contaminants in soil, groundwater or soil vapor for off-site workers are through inhalation, ingestion and absorption. **Appendix D** includes information sheets for chemicals that may be encountered at the site.

3.3.1 Respirable Dust

Dust may be generated from vehicular traffic and/or drilling activities. If visible observation detects elevated levels of dust, a program of wetting will be employed by the safety officer. If elevated dust levels persist, the safety office will employ dust monitoring using a particulate monitor. If monitoring detects concentrations greater than 150 µg/m3 over daily background, the safety officer will take corrective actions as defined herein, including the use of water for dust suppression and if this is not effective, requiring workers to wear APRs with efficiency particulate air (HEPA) cartridges.

Absorption pathways for dust and direct contact with soils or groundwater will be mitigated with the implementation of latex gloves, hand washing and decontamination exercises when necessary.

3.3.2 Dust Control and Monitoring During Earthwork

Dust generated during off-site activities or other earthwork may contain contaminants identified in soils. Dust will be controlled by wetting the working surface with water. Calcium chloride may be used if the problem cannot be controlled with water. Air monitoring and dust control techniques are specified in the Dust Control Plan (if applicable). Off-site workers will not be required to wear APR's unless dust concentrations are consistently over 150 µg/m3 over site-specific background in the breathing zone as measured by a dust monitor unless the safety officer directs workers to wear APRs. The safety officer will use visible dust as an indicator to implement the dust control plan.

3.3.3 Organic Vapors

The safety officer will periodically monitor organic vapors with a Photo-ionization Detector (PID) during off-site investigation to determine whether organic vapor concentrations exceed action levels shown in Section 5 and/or the Community Air Monitoring Plan.

4.0 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) shall be selected in accordance with the air monitoring program, OSHA 29 CFR 1910.120(c), (g), 1910.132, and COVID-19 requirements. Protective equipment shall be NIOSH approved and respiratory protection including face mask shall conform to OSHA 29 CFR Part 1910.133, 1910.134, and COVID-19 specifications; head protection shall conform to 1910.135; eye and face protection shall conform to 1910.133 and COVID-19; and foot protection shall conform to 1910.136. The only true difference among the levels of protection from D thru B is the addition of the type of respiratory protection. **It is anticipated that work will be performed in Level D PPE.**

4.1 Level D

Level D PPE shall be donned when the atmosphere contains no known hazards and work functions preclude splashes, immersion, or the potential for inhalation of, or contact with, hazardous concentrations of harmful chemicals. Level D PPE consists of:

- standard work clothes, coveralls, or Tyvek, as needed;
- steel toe and steel shank work boots;
- hard hat;
- gloves, as needed;
- safety glasses and/or face shield;
- face mask;
- hearing protection;
- equipment replacements are available as needed.

4.2 Level C

Level C PPE shall be donned when sustained concentrations of measured total organic vapors in the breathing zone exceed background concentrations (using a portable OVA, or equivalent), by more than 5 ppm. The specifications on the APR filters used must be appropriate for contaminants identified or expected to be encountered. Level C PPE shall be donned when the identified contaminants have adequate warning properties and criteria for using APR have been met. Level C PPE consists of:

- chemical resistant or coated Tyvek coveralls;
- steel-toe and steel-shank work boots;
- chemical resistant over-boots or disposable boot covers;
- disposable inner gloves (surgical gloves);
- disposable outer gloves;
- full face APR fitted with organic vapor/dust and mist filters or filters appropriate for the identified or expected contaminants;
- hard hat;
- face/splash shield, as needed; and,
- ankles/wrists taped with duct tape.

The safety officer will verify if Level C is appropriate by checking organic vapor concentrations using compound and/or class-specific detector tubes. The exact PPE ensemble is decided on a site-by-site basis by the Safety Officer with the intent to provide the most protective and efficient worker PPE.

4.3 Activity-Specific Levels of Personal Protection

The required level of PPE is activity-specific and is based on air monitoring results (Section 4.0) and properties of identified or expected contaminants. **It is expected that the off-site investigation will be performed in Level D.** If air monitoring results indicate the necessity to upgrade the level of protection, engineering controls (i.e., Facing equipment away from the wind and placing site personnel upwind of drilling, active venting, etc.) will be implemented before requiring the use of respiratory protection.

5.0 AIR MONITORING AND ACTION LEVELS

29 CFR 1910.120(h) specifies that monitoring shall be performed where there may be a question of employee exposure to hazardous concentrations of hazardous substances in order to assure proper selection of engineering controls, work practices and personal protective equipment so that employees are not exposed to levels which exceed permissible exposure limits or published exposure levels if there are no permissible exposure limits, for hazardous substances.

5.1 Air Monitoring Requirements

When off-site work is performed, air will be monitored for VOCs with a portable MiniRAE 3000 Photo Ionization Detector (PID), or the equivalent. If necessary, Lower Explosive Limit (LEL) and oxygen will be monitored with a Combustible Gas Indicator (CGI). If appropriate, fugitive dust will be monitored using a MiniRAE Model PDM-3 aerosol monitor. Air will be monitored when any of the following conditions apply:

- initial site entry;
- during any work where a potential IDLH condition or flammable atmosphere could develop;
- work begins on another portion of the site;
- contaminants, other than those previously identified, have been discovered;
- each time a different task or activity is initiated;
- during boring, trenching and/or excavation work.

The designated safety officer will record air monitoring data and ensure that air monitoring instruments are calibrated and maintained in accordance with manufacturer's specifications. Instruments will be zeroed daily and checked for accuracy. Monitoring results will be recorded in a field notebook and will be transferred to instrument reading logs.

5.2 Work Stoppage Responses

The following responses will be initiated whenever one or more of the action levels necessitating a work stoppage is exceeded:

1. The SSO will be consulted immediately.
2. All personnel (except as necessary for continued monitoring and contaminant migration, if applicable) will be cleared from the work area (e.g., from the exclusion zone).
3. Monitoring will be continued until intrusive work resumes.

5.3 Action Levels During Site Activities

Instrument readings will be taken in the breathing zone on off-site locations unless otherwise noted. Each action level is independent of all other action levels in determining responses.

Organic Vapors (PID)	LEL %	Responses
0-1 ppm above background	0%	• Continue with drilling activities • Level D protection • Continue monitoring every 10 minutes
1-50 ppm Above Background, Sustained Reading	1-30%	• Continue with drilling activities • Level D protection • Continue monitoring every 10 minutes
50-250 ppm Above Background, Sustained Reading	30-60%	• Continue with drilling activities • Level D protection and employ engineering controls • Continue monitoring for organic vapors 200 ft downwind • Continuous monitoring for LEL

>250 ppm Above Background, Sustained Reading	>60%	• Discontinue drilling activities, unless PID is only action level exceeded • Employ engineering controls • Continuous monitoring for organic vapors 200 ft downwind.

Notes: Air monitoring will occur in the breathing zone 30 inches above the sidewalk grade. If action levels for any one of the monitoring parameters are exceeded, the appropriate responses listed in the right-hand column should be taken.

6.0 SITE CONTROL

6.1 Work Zones

The primary purpose of site controls is to establish the perimeter of a hazardous area, to reduce the migration of contaminants into clean areas, and to prevent access or exposure to hazardous materials by unauthorized persons. When operations are to take place involving hazardous materials, the safety officer will establish an exclusion zone, a decontamination zone, and a support zone. These zones "float" (move around the site) depending on the tasks being performed on any given day. The safety officer will outline these locations before work begins and when zones change. The safety officer records this information in the logbook.

Due to the nature and extent of the work area, it is expected that an exclusion zone will not be required. All workers during drilling activities must provide evidence of OSHA 40-hour Hazardous Waste Operations and Emergency Response Operations training to conduct work within the exclusion zone established by the safety officer. The exclusion zone is defined by the safety officer but will typically be a 50-foot area around work activities. Gross decontamination (as determined by the site Health and Safety Officer) is conducted in the exclusion zone; all other decontamination is performed in the decontamination zone or trailer, if provided.

Protective equipment is removed in the decontamination zone. Disposable protective equipment is stored in receptacles staged in the decontamination zone, and non-disposable equipment is decontaminated. All personnel and equipment exit the exclusion zone through the decontamination zone. If a decontamination trailer is provided the first aid equipment, an eye wash unit, and drinking water are kept in the decontamination trailer.

The support zone is used for vehicle parking, daily safety meetings, and supply storage. Eating, drinking, and smoking are permitted only in the support zone. When a decontamination trailer is not provided, the eye wash unit, first aid equipment, and drinking water are kept at a central location designated by the safety officer.

7.0 CONTINGENCY PLAN/EMERGENCY RESPONSE PLAN

The personnel must be prepared in the event of an emergency. Emergencies can take many forms: illnesses, injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather. Emergency telephone numbers and a map to the hospital will be posted in the command post. The personnel should be familiar with the emergency procedures, and the locations of safety, first aid, and communication equipment.

7.1 Emergency Equipment On-site

Private telephones:	Site personnel.
Two-way radios:	Site personnel where necessary.
Emergency Alarms:	On-site vehicle horns*.
First aid kits:	On-site, in vehicles or office.
Fire extinguisher:	On-site, in office or on equipment.

* Horns: Air horns will be supplied to personnel at the discretion of the project superintendent or site safety officer.

7.2 Emergency Telephone Numbers

General Emergencies	911
Fire Department	911
Coney Island Hospital Emergency Department	(718) 616-4327
NYSDEC Spills Hotline	(800) 457-7362
National Response Center	(800) 424-8802
Poison Control	(800) 222-1222
Project Manager	(347) 345-9075
Sr. Project Manager	(347) 728-0768
Site Safety Officer	(646) 249-6129

7.3 Personnel Responsibilities During an Emergency

The project manager is primarily responsible for responding to and correcting any emergency situations. However, in the absence of the project manager, the safety officer shall act as the project manager's on-site designee and perform the following tasks:

- Take appropriate measures to protect personnel including: withdrawal from the exclusion zone, evacuate and secure the locations, or upgrade/downgrade the level of protective clothing and respiratory protection;
- Ensure that appropriate federal, state, and local agencies are informed, and emergency response plans are coordinated. In the event of fire or explosion, the local fire department should be summoned immediately. If toxic materials are released to the air, the local authorities should be informed in order to assess the need for evacuation;
- Ensure appropriate decontamination, treatment, or testing for exposed or injured personnel;
- Determine the cause of incidents and make recommendations to prevent recurrence; and,
- Ensure that all required reports have been prepared.

The following key personnel are planned for this project:

- Jazlyn Natalie, Project Manager (347) 345-9075
- Drumita Dmello, Site Safety Officer (646) 249-6129

7.4 Medical Emergencies

A person who becomes ill or injured in the exclusion zone will be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination will be completed and first aid administered prior to transport. First aid will be administered while waiting for an ambulance or paramedics. A Field Accident Report (**Appendix E**) must be filled out for any injury.

A person transporting an injured/exposed person to a clinic or hospital for treatment will take the directions to the hospital (**Appendix F**) and information on the chemical(s) to which they may have been exposed (**Appendix D**).

7.5 Fire or Explosion

In the event of a fire or explosion, the local fire department will be summoned immediately. The site safety officer or his designated alternate will advise the fire commander of the location, nature and identification of the hazardous materials for off-site locations. If it is safe to do so, site personnel may:

- use of firefighting equipment available on site; or,
- remove or isolate flammable or other hazardous materials that may contribute to the fire.

7.6 Evacuation Routes

Evacuation routes established by work area locations for each site will be reviewed prior to commencing site operations. As the work areas change, the evacuation routes will be altered accordingly, and the new route will be reviewed.

Under extreme emergency conditions, evacuation is to be immediate without regard for equipment. The evacuation signal will be a continuous blast of a vehicle horn, if possible, and/or by verbal/radio communication. When evacuating the work area, personnel will follow these instructions:

- Keep upwind of smoke, vapors, or spill location.
- Exit through the decontamination corridor if possible.
- If evacuation through the decontamination corridor is not possible, personnel should remove contaminated clothing once they are in a safe location and leave it near the exclusion zone or in a safe place.
- The safety officer will conduct a head count to ensure that all personnel have been evacuated safely. The head count will be correlated to the site and/or exclusion zone entry/exit log.
- If emergency site evacuation is necessary, all personnel are to escape the emergency situation and decontaminate to the maximum extent practical.

7.7 Spill Control Procedures

Spills associated with site activities may be attributed to project equipment and include gasoline, diesel and hydraulic oil. In the event of a leak or a release, site personnel will inform their supervisor immediately, locate the source of spillage and stop the flow if it can be done safely. A spill containment kit including absorbent pads, booms and/or granulated speedy dry absorbent material will be available to site personnel to facilitate the immediate recovery of the spilled material. Daily inspections of site equipment components including hydraulic lines, fuel tanks, etc. will be performed by their respective operators as a preventative measure for equipment leaks and to ensure equipment soundness. In the event of a spill, site personnel will immediately notify the NYSDEC (1-800-457-7362), and a spill number will be generated.

7.8 Vapor Release Plan

If work zone organic vapor (excluding methane) exceeds 5 ppm, then a downwind reading will be made either 200 feet from the work zone or at the property line, whichever is closer. If readings at this location exceed 5 ppm over background, the work will be stopped. If 5 ppm of VOCs are recorded over background on a PID at the property line, then an off-site reading will be taken within 20 feet of the nearest residential or commercial property, whichever is closer. If efforts to mitigate the emission source are unsuccessful for 30 minutes, then the designated site safety officer will:

- contact the local police;
- continue to monitor air every 30 minutes, 20 feet from the closest off-site property. If two successive readings are below 5 ppm (non-methane), off-site air monitoring will be halted.
- All property line and off-site air monitoring locations and results associated with vapor releases will be recorded in the site safety logbook.

APPENDIX A
SITE SAFETY ACKNOWLEDGEMENT FORM

DAILY BREIFING SIGN-IN SHEET

Date:_____ Person Conducting Briefing:_____

Project Name and Location:_____

1. AWARENESS (topics discussed, special safety concerns, recent incidents, etc…):_____

_____

_____

_____

_____

2. OTHER ISSUES (HASP changes, attendee comments, etc…):_____

_____

_____

_____

_____

3. ATTENDEES (Print Name):

1.	11.
2.	12.
3.	13.
4.	14.
5.	15.
6.	16.
7.	17.
8.	18.
9.	19.
10.	20.

APPENDIX B
COVID-19 DISCLOSURE FORM

Declaration Form (COVID-19)

Due to COVID-19, we are asking all employees, sub-contractors and clients to sign a declaration prior to coming on to the Site: _____ for the Health and Safety of everyone involved.

Prior to coming to the Site, we ask that you review the questions below and make a declaration if your response to all the questions below are "No".

- Have you, or anyone whom you are sharing a residence with, been in contact with any person suffering or suspected to be suffering from COVID-19 in the last 14-days?
- Did you have any fever in the last 48-hours or do you have the respiratory symptoms (e.g., cough, runny nose, sore throat or breathing difficulty)?
- Have you travelled outside the U.S in the last 21-days?

If your response to any of the above questions is "Yes", then we regret to inform that you are not permitted to the Site at this time.

By signing below, it is your declaration that your responses to the above questions are "No", and that this declaration is true and accurate to the best of your knowledge.

Date	Print Name	Temperature (F)	Signature

DUE TO COVID-19 REGULATIONS: Everyone must wear a mask at all times and maintain social distancing.

DEBIDO A LAS REGULACIONES DE COVID-19: Todos deben usar una mascara en todo momento y mantener el distanciamiento social.

APPENDIX C

SITE SAFETY PLAN AMENDMENTS

SITE SAFETY PLAN AMENDMENT FORM

Site Safety Plan Amendment #: _____

Site Name: _____

Reason for Amendment: _____

_____

_____

_____

_____

Alternative Procedures: _____

_____

_____

_____

Required Changes in PPE: _____

_____

_____

_____

_____

_____ _____

Project Superintendent (signature) Date

_____ _____

Health and Safety Consultant (signature) Date

_____

Site Safety Officer (signature) Date

APPENDIX D
CHEMICAL HAZARDS

CHEMICAL HAZARDS

The attached International Chemical Safety Cards are provided for contaminants of concern that have been identified in soils and/or groundwater at the site.

1,1,1,2-TETRACHLOROETHANE	ICSC: 1486 (April 2004)

CAS #: 630-20-6
UN #: 1702
EC Number: 211-135-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Gives off irritating or toxic fumes (or gases) in a fire.	NO contact with hot surfaces. NO open flames.	In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Headache. Nausea. Shortness of breath. Vomiting.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness. Burning sensation. Pain.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Headache. Nausea.	Do not eat, drink, or smoke during work.	Do NOT induce vomiting. Refer for medical attention . Give one or two glasses of water to drink.

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in dry sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.

STORAGE

Separated from strong oxidants and strong bases. Well closed.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,1,1,2-TETRACHLOROETHANE **ICSC: 1486**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
YELLOW-TO-RED LIQUID.

Physical dangers

Chemical dangers
Decomposes on heating. This produces toxic and corrosive gases including hydrogen chloride. Reacts with strong bases and strong oxidants.

Formula: $C_2H_2Cl_4$ / Cl_3CCH_2Cl
Molecular mass: 167.8
Boiling point: 130.5°C
Melting point: -70.2°C
Relative density (water = 1): 1.54
Solubility in water, g/100ml at 25°C: 0.11
Vapour pressure, kPa at 25°C: 1.9
Octanol/water partition coefficient as log Pow: 2.66

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by ingestion and by inhalation.

Effects of short-term exposure
The substance is irritating to the eyes and skin. The substance may cause effects on the central nervous system.

Inhalation risk
No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

See ICSC 0332.

ADDITIONAL INFORMATION

EC Classification

1,1,1-TRICHLOROETHANE **ICSC: 0079 (April 2007)**

Methyl chloroform
Methyltrichloromethane
alpha-Trichloroethane

CAS #: 71-55-6
UN #: 2831
EC Number: 200-756-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Heating will cause rise in pressure with risk of bursting. Gives off irritating or toxic fumes (or gases) in a fire. See Notes.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Headache. Dizziness. Drowsiness. Nausea. Incoordination. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Nausea. Vomiting. Abdominal pain. Diarrhoea. Further see Inhalation.	Do not eat, drink, or smoke during work.	Do NOT induce vomiting. Rinse mouth. Give a slurry of activated charcoal in water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: self-contained breathing apparatus. Ventilation. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from food and feedstuffs, strong oxidants, aluminium, magnesium and zinc. Cool. Dry. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

Causes mild skin irritation
Causes eye irritation
May cause drowsiness and dizziness
May cause damage to cardiovascular system if inhaled
Harmful to aquatic life

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,1,1-TRICHLOROETHANE **ICSC: 0079**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air.

Chemical dangers
Decomposes on burning. This produces toxic and corrosive fumes. Reacts violently with aluminium, aluminium alloys, magnesium, bases, strong oxidants, acetone and zinc.

Formula: $C_2H_3Cl_3$ / CCl_3CH_3
Molecular mass: 133.4
Boiling point: 74°C
Melting point: -30°C
Relative density (water = 1): 1.34
Solubility in water: poor
Vapour pressure, kPa at 20°C: 13.3
Relative vapour density (air = 1): 4.6
Flash point: see Notes
Auto-ignition temperature: 537°C
Explosive limits, vol% in air: 8-16
Octanol/water partition coefficient as log Pow: 2.49

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Effects of short-term exposure
The substance is mildly irritating to the eyes, respiratory tract and skin. The substance may cause effects on the central nervous system. This may result in lowering of consciousness. Exposure at high levels could cause cardiac dysrhythmia.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 350 ppm as TWA; 450 ppm as STEL; A4 (not classifiable as a human carcinogen); BEI issued.
MAK: 550 mg/m^3, 100 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: C.
EU-OEL: 555 mg/m^3, 100 ppm as TWA; 1110 mg/m^3, 200 ppm as STEL

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Combustible vapour/air mixtures difficult to ignite, may be developed under certain conditions.
The substance burns only in excess oxygen or if a strong source of ignition is present.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.
An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.
Depending on the degree of exposure, periodic medical examination is suggested.
Use of alcoholic beverages enhances the harmful effect.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; Note: F; R: 20-59; S: (2)-24/25-59-61

1,1,2,2-TETRACHLOROETHANE **ICSC: 0332 (April 2017)**

Acetylene tetrachloride
sym-Tetrachloroethane
1,1-Dichloro-2-2,dichloroethane

CAS #: 79-34-5
UN #: 1702
EC Number: 201-197-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO contact with incompatible substances. See Chemical Dangers.	In case of fire in the surroundings, use appropriate extinguishing media.

STRICT HYGIENE! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Headache. Nausea. Vomiting. Dizziness. Drowsiness. Convulsions. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness. Dry skin. Further see Inhalation.	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer for medical attention.
Ingestion	Abdominal pain. Nausea. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Ventilation. Collect leaking liquid in covered containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from strong bases, alkali metals and food and feedstuffs. Well closed. Cool. Keep in the dark. Ventilation along the floor. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Toxic if swallowed or if inhaled
Causes skin and eye irritation
May cause respiratory irritation
May cause drowsiness or dizziness
May cause damage to liver
May cause damage to liver through prolonged or repeated exposure
Suspected of causing cancer
Suspected of causing genetic defects
Toxic to aquatic life

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,1,2,2-TETRACHLOROETHANE **ICSC: 0332**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes on heating and under the influence of air, UV light and moisture. This produces toxic and corrosive gases including hydrogen chloride and phosgene. Reacts violently with alkali metals, strong bases and powdered metals. This produces toxic and corrosive gases. Attacks plastics and rubber.

Formula: $C_2H_2Cl_4$ / $CHCl_2CHCl_2$
Molecular mass: 167.9
Boiling point: 146°C
Melting point: -42,5°C
Relative density (water = 1): 1.59
Solubility in water, g/100ml at 20°C: 0.29
Vapour pressure, Pa at 20°C: 647
Relative vapour density (air = 1): 5.8
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.03
Viscosity: 1.11 mm²/s at 20°C
Octanol/water partition coefficient as log Pow: 2.39

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system, liver and kidneys. This may result in central nervous system depression and impaired functions. Exposure could cause unconsciousness. Exposure could cause death.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system and liver. This may result in impaired functions. This substance is possibly carcinogenic to humans. May cause heritable genetic damage to human germ cells.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: 14 mg/m^3, 2 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: D

ENVIRONMENT

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

The odour warning when the exposure limit value is exceeded is insufficient.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION

EC Classification
Symbol: T+, N; R: 26/27-51/53; S: (1/2)-38-45-61

1,1,2-TRICHLOROETHANE **ICSC: 0080 (April 2009)**

Vinyl trichloride
beta-Trichloroethane

CAS #: 79-00-5
UN #: 2810
EC Number: 201-166-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Heating will cause rise in pressure with risk of bursting. See Notes.	NO open flames. NO contact with hot surfaces.	Use powder, water spray, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Dizziness. Drowsiness. Headache. Nausea.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Dry skin. Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness.	Wear safety spectacles or face shield.	Rinse with plenty of water (remove contact lenses if easily possible). Refer for medical attention.
Ingestion	Aspiration hazard! See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention . Do NOT induce vomiting.

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants, strong bases and metals. Well closed. Ventilation along the floor. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.

PACKAGING

Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Harmful if swallowed
Toxic if inhaled
Causes mild skin irritation
Causes eye irritation
May cause drowsiness or dizziness
May be fatal if swallowed and enters airways
Harmful to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,1,2-TRICHLOROETHANE **ICSC: 0080**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air.

Chemical dangers
Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive gases including hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Reacts with strong bases, strong oxidants and metals. This generates fire and explosion hazard.

Formula: $C_2H_3Cl_3$ / $CHCl_2CH_2Cl$
Molecular mass: 133.4
Boiling point: 114°C
Melting point: -36°C
Relative density (water = 1): 1.4
Solubility in water, g/100ml at 20°C: 0.45 (very poor)
Vapour pressure, kPa at 20°C: 2.5
Relative vapour density (air = 1): 4.6
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.09
Explosive limits, vol% in air: 6-15.5
Octanol/water partition coefficient as log Pow: 2.35
Viscosity: 1.17 mm²/s at 25°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes and respiratory tract. The substance is mildly irritating to the skin. The substance may cause effects on the central nervous system. This may result in lowering of consciousness. The substance may cause effects on the kidneys and liver. This may result in impaired functions. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. Repeated or prolonged contact with skin may cause dryness and cracking.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: 5,5 mg/m^3, 1 ppm; peak limitation category: I(2); skin absorption (H); pregnancy risk group: D; carcinogen category: 3

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Combustible vapour/air mixtures difficult to ignite, may be developed under certain conditions.
Use of alcoholic beverages enhances the harmful effect.
The relation between odour and the occupational exposure limit cannot be indicated.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn; R: 20/21/22-40-66; S: (2)-9-36/37-46

1,1-DICHLOROETHANE **ICSC: 0249 (April 2017)**

Ethane, 1,1-dichloro-
Ethylidene chloride

CAS #: 75-34-3
UN #: 2362
EC Number: 200-863-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	Use water spray, foam, powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Lethargy. Nausea. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Roughness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: self-contained breathing apparatus. Do NOT wash away into sewer. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. See Chemical Dangers. Cool.

PACKAGING

Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Highly flammable liquid and vapour
May cause damage to liver and kidneys through prolonged or repeated exposure
Harmful to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: II

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

1,1-DICHLOROETHANE **ICSC: 0249**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers
Decomposes on heating and on burning. This produces toxic and corrosive fumes including phosgene (see ICSC 0007) and hydrogen chloride (see ICSC 0163). Reacts violently with strong oxidants, alkali metals, alkaline earth metals and powdered metals. This generates fire and explosion hazard. Attacks aluminium, iron and polyethylene. Contact with strong caustic causes formation of flammable and toxic acetaldehyde gas.

Formula: CH_3CHCl_2
Molecular mass: 99.0
Boiling point: 57°C
Melting point: -98°C
Relative density (water = 1): 1.2
Solubility in water, g/100ml at 20°C: 0.6 (poor)
Vapour pressure, kPa at 20°C: 24
Relative vapour density (air = 1): 3.4
Flash point: -6°C c.c.
Auto-ignition temperature: 458°C
Explosive limits, vol% in air: 5.6-11.4
Octanol/water partition coefficient as log Pow: 1.8

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes and upper respiratory tract. The substance may cause effects on the central nervous system. Exposure at high levels could cause unconsciousness.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the kidneys and liver.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 100 ppm as TWA; A4 (not classifiable as a human carcinogen).
MAK: 205 mg/m^3, 50 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: C; carcinogen category: 3.
EU-OEL: 412 mg/m^3, 100 ppm as TWA; (skin)

ENVIRONMENT

The substance is harmful to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, Xn; R: 11-22-36/37-52/53; S: (2)-16-23-61

VINYLIDENE CHLORIDE **ICSC: 0083 (April 2014)**

1,1-Dichloroethene
1,1-Dichloroethylene
VDC

CAS #: 75-35-4
UN #: 1303 (stabilized)
EC Number: 200-864-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Extremely flammable. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non-sparking handtools.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Dizziness. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Evacuate danger area! Remove all ignition sources. Consult an expert! Personal protection: filter respirator for organic vapours of low boiling point adapted to the airborne concentration of the substance. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Store only if stabilized. Fireproof. Keep in the dark. Cool. Separated from incompatible materials. See Chemical Dangers. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

Airtight.
Unbreakable packaging.
Put breakable packaging into closed unbreakable container.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Extremely flammable liquid and vapour
Toxic if swallowed
May be harmful if inhaled
May cause drowsiness or dizziness
May cause damage to liver and kidneys through prolonged or repeated exposure
Harmful to aquatic life

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: I

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

VINYLIDENE CHLORIDE **ICSC: 0083**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
VOLATILE COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible. Vapours are uninhibited and may polymerize, causing blockage of vents.

Chemical dangers
The substance can readily form explosive peroxides. The substance readily polymerizes due to heating or under the influence of oxygen, sunlight, copper or aluminium. This generates fire or explosion hazard. May explode on heating or on contact with flames. Decomposes on burning. This produces toxic and corrosive fumes of hydrogen chloride and phosgene. Reacts violently with oxidants.

Formula: $C_2H_2Cl_2$ / $H_2C=CCl_2$
Molecular mass: 97.0
Boiling point: 32°C
Melting point: -122°C
Relative density (water = 1): 1.2
Solubility in water, g/100ml at 25°C: 0.25 (very poor)
Vapour pressure, kPa at 20°C: 66.5
Relative vapour density (air = 1): 3.3
Relative density of the vapour/air-mixture at 20°C (air = 1): 2.5
Flash point: -25°C c.c.
Auto-ignition temperature: 530°C
Explosive limits, vol% in air: 5.6-16
Octanol/water partition coefficient as log Pow: 2.41

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure
The substance is mildly irritating to the eyes and upper respiratory tract. Exposure far above the OEL could cause lowering of consciousness.

Inhalation risk
A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance may have effects on the kidneys and liver. This may result in liver function impairment and kidney impairment. Tumours have been detected in experimental animals but may not be relevant to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as TWA; A4 (not classifiable as a human carcinogen).
MAK: 8.0 mg/m^3, 2 ppm; peak limitation category: II(2); carcinogen category: 3; pregnancy risk group: C.
EU-OEL: 8 mg/m^3, 2 ppm as TWA; 20 mg/m^3, 5 ppm as STEL

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.
The odour warning when the exposure limit value is exceeded is insufficient.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION

EC Classification
Symbol: F+, Xn; R: 12-20-40; S: (2)-7-16-29-36/37-46; Note: D

1,2,4-TRICHLOROBENZENE **ICSC: 1049 (November 2003)**

1,2,4-Trichlorobenzol
unsym-Trichlorobenzene

CAS #: 120-82-1
UN #: 2321
EC Number: 204-428-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder, foam, carbon dioxide.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness. Roughness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Sore throat. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. If solid: sweep spilled substance into sealable containers. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants, acids and food and feedstuffs.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,2,4-TRICHLOROBENZENE **ICSC: 1049**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID OR WHITE CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes on burning. This produces toxic fumes including hydrogen chloride. Reacts violently with oxidants.

Formula: $C_6H_3Cl_3$
Molecular mass: 181.5
Boiling point: 213°C
Melting point: 17°C
Relative density (water = 1): 1.5
Solubility in water, mg/l: 34.6
Vapour pressure, Pa at 25°C: 40
Relative vapour density (air = 1): 6.26
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.002
Flash point: 105°C c.c.
Auto-ignition temperature: 571°C
Explosive limits, vol% in air: 2.5-6.6 (at 150°C)
Octanol/water partition coefficient as log Pow: 3.98

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the liver.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as STEL.
MAK: skin absorption (H); carcinogen category: 3.
EU-OEL: 15.1 mg/m^3, 2 ppm as TWA; 37.8 mg/m^3, 5 ppm as STEL; (skin)

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

The occupational exposure limit value should not be exceeded during any part of the working exposure.
See ICSCs 0344 and 1222.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 22-38-50/53; S: (2)-23-37/39-60-61

1,2,4-TRIMETHYLBENZENE **ICSC: 1433 (June 2002)**
Pseudocumene

CAS #: 95-63-6
UN #: 1993
EC Number: 202-436-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 44°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 44°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	Use alcohol-resistant foam, dry powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Confusion. Cough. Dizziness. Drowsiness. Headache. Sore throat. Vomiting.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Dry skin.	Protective gloves.	Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer. Do NOT let this chemical enter the environment.

STORAGE

Fireproof. Separated from strong oxidants. Well closed. Keep in a well-ventilated room.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,2,4-TRIMETHYLBENZENE **ICSC: 1433**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes on burning. This produces toxic and irritating fumes. Reacts violently with strong oxidants. This generates fire and explosion hazard.

Formula: C_9H_{12}
Molecular mass: 120,2
Boiling point: 169°C
Melting point: -44°C
Relative density (water = 1): 0.88
Solubility in water: very poor
Relative vapour density (air = 1): 4.1
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01
Flash point: 44°C c.c.
Auto-ignition temperature: 500°C
Explosive limits, vol% in air: 0.9-6.4
Octanol/water partition coefficient as log Pow: 3.8

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. Repeated or prolonged inhalation may cause effects on the lungs. This may result in chronic bronchitis. The substance may have effects on the central nervous system and blood. See Notes.

OCCUPATIONAL EXPOSURE LIMITS

EU-OEL: 100 mg/m^3, 20 ppm as TWA.
MAK: 100 mg/m^3, 20 ppm; peak limitation category: II(2); pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

Use of alcoholic beverages enhances the harmful effect.
Depending on the degree of exposure, periodic medical examination is suggested.
See ICSCs 1155, 1362 and 1389.
1,3,5-Trimethylbenzene (Mesitylene) is classified as a marine pollutant.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 10-20-36/37/38-51/53; S: (2)-26-61

ETHYLENE DIBROMIDE **ICSC: 0045 (June 2012)**

1,2-Dibromoethane
EDB

CAS #: 106-93-4
UN #: 1605
EC Number: 203-444-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion. See Chemical Dangers.	NO contact with incompatible materials: See Chemical Dangers	In case of fire in the surroundings, use appropriate extinguishing media.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Burning sensation. Cough. Laboured breathing. Shortness of breath. Vomiting. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Vomiting. Drowsiness.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants, strong bases, powdered metals and food and feedstuffs. See Chemical Dangers. Ventilation along the floor. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Toxic if swallowed, in contact with skin or if inhaled
Causes skin and eye irritation
May cause respiratory irritation
May cause cancer
Suspected of damaging fertility or the unborn child
Causes damage to liver and kidneys
May cause drowsiness or dizziness
Harmful to aquatic life

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: I

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

ETHYLENE DIBROMIDE **ICSC: 0045**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR. TURNS BROWN ON EXPOSURE TO LIGHT.

Physical dangers

Chemical dangers
Decomposes on heating or on burning and on contact with hot surfaces. This produces toxic and corrosive fumes of hydrogen bromide and bromine (see ICSC 0107). Reacts violently with powdered aluminium, powdered magnesium, calcium, strong bases and strong oxidants. This generates fire and explosion hazard. Attacks some forms of plastic, rubber and coatings.

Formula: $Br(CH_2)_2Br$ / $C_2H_4Br_2$
Molecular mass: 187.9
Boiling point: 131°C
Melting point: 10°C
Relative density (water = 1): 2.2
Solubility in water, g/100ml at 20°C: 0.34 (poor)
Vapour pressure, kPa at 20°C: 1.5
Relative vapour density (air = 1): 6.5
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.06
Octanol/water partition coefficient as log Pow: 1.96

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the liver and kidneys. This may result in tissue lesions. Exposure at high concentrations could cause lowering of consciousness and death. The effects may be delayed.

Inhalation risk
A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidneys, resulting in impaired functions. This substance is probably carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: skin absorption (H); carcinogen category: 2.
EU-OEL: 0.8 mg/m^3, 0.1 ppm as TWA; (skin)

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 45-23/24/25-36/37/38-51/53; S: 53-45-61; Note: E

1,2-DICHLOROBENZENE **ICSC: 1066 (November 2003)**
ortho-Dichlorobenzene

CAS #: 95-50-1
UN #: 1591
EC Number: 202-425-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Above 66°C explosive vapour/air mixtures may be formed.	NO open flames. Above 66°C use a closed system and ventilation.	Use water spray, powder, foam, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Drowsiness. Sore throat. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain. Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Diarrhoea. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from aluminium, oxidants and food and feedstuffs.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,2-DICHLOROBENZENE **ICSC: 1066**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-YELLOW LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes on burning. This produces toxic and corrosive gases including hydrogen chloride. Reacts with aluminium and oxidants. Attacks plastics and rubber.

Formula: $C_6H_4Cl_2$
Molecular mass: 147.0
Boiling point: 180-183°C
Melting point: -17°C
Relative density (water = 1): 1.3
Solubility in water: very poor
Vapour pressure, kPa at 20°C: 0.16
Relative vapour density (air = 1): 5.1
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.006
Flash point: 66°C c.c.
Auto-ignition temperature: 648°C
Explosive limits, vol% in air: 2.2-9.2
Octanol/water partition coefficient as log Pow: 3.38

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system and liver. Exposure could cause lowering of consciousness.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the kidneys and blood.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 25 ppm as TWA; 50 ppm as STEL; A4 (not classifiable as a human carcinogen).
MAK: 61 mg/m^3, 10 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: C.
EU-OEL: 122 mg/m^3, 20 ppm as TWA; 306 mg/m^3, 50 ppm as STEL; (skin)

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. It is strongly advised not to let the chemical enter into the environment.

NOTES

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 22-36/37/38-50/53; S: (2)-23-60-61

1,2-DICHLOROETHANE **ICSC: 0250 (April 2013)**

Ethylene dichloride
1,2-Ethylene dichloride
Ethane dichloride

CAS #: 107-06-2
UN #: 1184
EC Number: 203-458-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive. Heating will cause rise in pressure with risk of bursting.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling.	Use water spray, foam, powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Sore throat. Nausea. Vomiting. Cough. Headache. Dizziness. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Administration of oxygen may be needed. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer immediately for medical attention.
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Evacuate danger area! Consult an expert! Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from food and feedstuffs and incompatible materials. See Chemical Dangers. Cool. Dry. Well closed. Store in an area without drain or sewer access.

PACKAGING

Unbreakable packaging.
Put breakable packaging into closed unbreakable container.
Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Highly flammable liquid and vapour
Harmful if swallowed
May be harmful in contact with skin
Toxic if inhaled
Causes skin and eye irritation
Suspected of causing cancer
Causes damage to lungs, liver and kidneys
May cause drowsiness or dizziness
May cause damage to liver and kidneys through prolonged or repeated exposure
Harmful to aquatic life

Transportation
UN Classification
UN Hazard Class: 3; UN Subsidiary Risks: 6.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,2-DICHLOROETHANE **ICSC: 0250**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS VISCOUS LIQUID WITH CHARACTERISTIC ODOUR. TURNS DARK ON EXPOSURE TO AIR, MOISTURE AND LIGHT.

Physical dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
Decomposes on heating and on burning. This produces toxic and corrosive fumes including hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Reacts with alkali metals, powdered metals, ammonia, bases and strong oxidants. This generates fire and explosion hazard. Attacks many metals in the presence of water.

Formula: $ClCH_2CH_2Cl$ / $C_2H_4Cl_2$
Molecular mass: 98.96
Boiling point: 83.5°C
Melting point: -35.7°C
Relative density (water = 1): 1.2
Solubility in water, g/100ml: 0.87
Vapour pressure, kPa at 20°C: 8.7
Relative vapour density (air = 1): 3.42
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2
Flash point: 13°C c.c.
Auto-ignition temperature: 440°C
Explosive limits, vol% in air: 4.2-16
Octanol/water partition coefficient as log Pow: 1.48

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure
The vapour is irritating to the eyes, skin and respiratory tract. Inhalation may cause lung oedema. See Notes. The substance may cause effects on the kidneys and liver. This may result in impaired functions, liver damage and kidney damage. Exposure at high concentrations could cause lowering of consciousness and death. The effects may be delayed.

Inhalation risk
A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidneys, resulting in impaired functions. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; A4 (not classifiable as a human carcinogen).
MAK: skin absorption (H); carcinogen category: 2.
EU-OEL: 8.2 mg/m^3, 2 ppm as TWA; (skin)

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, T; R: 45-11-22-36/37/38; S: 53-45; Note: E

1,2-DICHLOROPROPANE **ICSC: 0441 (June 2015)**

Propylene dichloride

CAS #: 78-87-5
UN #: 1279
EC Number: 201-152-2

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Heating will cause rise in pressure with risk of bursting. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	Use powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Cough. Sore throat. Headache. Drowsiness. Dizziness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness. Pain.	Protective gloves.	Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Nausea. Headache. Drowsiness. Abdominal pain. Vomiting. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention . Do NOT induce vomiting.

SPILLAGE DISPOSAL

Remove all ignition sources. Personal protection: self-contained breathing apparatus. Ventilation. Do NOT wash away into sewer. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Highly flammable liquid and vapour
Harmful if swallowed or if inhaled
May cause an allergic skin reaction
May cause cancer
May cause damage to central nervous system
May cause damage to liver and kidneys through prolonged or repeated exposure
Harmful to aquatic life

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: II

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

1,2-DICHLOROPROPANE **ICSC: 0441**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers
On combustion, forms toxic and corrosive fumes. Attacks aluminium alloys and some types of plastic. Reacts violently with strong oxidants. This generates fire and explosion hazard.

Formula: $C_3H_6Cl_2$ - $CH_3CHClCH_2Cl$
Molecular mass: 113.0
Boiling point: 96°C
Melting point: -100°C
Relative density (water = 1): 1.16
Solubility in water, g/100ml at 20°C: 0.26
Vapour pressure, kPa at 20°C: 27.9
Relative vapour density (air = 1): 3.9
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.15
Flash point: 16°C c.c.
Auto-ignition temperature: 557°C
Explosive limits, vol% in air: 3.4-14.5
Octanol/water partition coefficient as log Pow: 2.02 (calculated)

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact may cause skin sensitization. The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the liver and kidneys. This substance is carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; (DSEN); A4 (not classifiable as a human carcinogen).
MAK: skin absorption (H); carcinogen category: 1

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, Xn; R: 11-20/22; S: (2)-16-24

DICHLOROTETRAFLUOROETHANE **ICSC: 0649 (November 1998)**

1,2-Dichloro-1,1,2,2-tetrafluoroethane
CFC114

CAS #: 76-14-2
UN #: 1958
EC Number: 200-937-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Heating will cause rise in pressure with risk of bursting. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Suffocation. See Notes.	Use ventilation.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention .
Eyes	See Skin.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion			

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Ventilation. NEVER direct water jet on liquid. Do NOT let this chemical enter the environment. Personal protection: chemical protection suit including self-contained breathing apparatus.	**According to UN GHS Criteria**
STORAGE	**Transportation**
Fireproof if in building. Cool.	**UN Classification**
PACKAGING	UN Hazard Class: 2.2

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

DICHLOROTETRAFLUOROETHANE **ICSC: 0649**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS COMPRESSED LIQUEFIED GAS.

Physical dangers
The gas is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

Chemical dangers
Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive gases including hydrogen chloride and hydrogen fluoride.

Formula: $C_2Cl_2F_4$ / $ClF_2C\text{-}CClF_2$
Molecular mass: 170.92
Boiling point: 4.1°C
Melting point: -94°C
Relative density (water = 1): 1.5
Solubility in water at 25°C: none
Vapour pressure, kPa at 25°C: 268
Relative vapour density (air = 1): 5.89
Octanol/water partition coefficient as log Pow: 2.8

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation.

Effects of short-term exposure
Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the cardiovascular system. This may result in cardiac disorders.

Inhalation risk
A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1000 ppm as TWA; A4 (not classifiable as a human carcinogen).
MAK: 7100 mg/m^3, 1000 ppm; peak limitation category: II(8); pregnancy risk group: D

ENVIRONMENT

Avoid release to the environment because of its impact on the ozone layer.

NOTES

High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death.
Check oxygen content before entering area.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.
Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

ADDITIONAL INFORMATION

EC Classification

1,3,5-TRIMETHYLBENZENE **ICSC: 1155 (June 2002)**
Mesitylene

CAS #: 108-67-8
UN #: 2325
EC Number: 203-604-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 50°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 50°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	Use alcohol-resistant foam, dry powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Confusion. Cough. Dizziness. Drowsiness. Headache. Sore throat. Vomiting.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from strong oxidants. Well closed. Keep in a well-ventilated room.

PACKAGING

Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,3,5-TRIMETHYLBENZENE **ICSC: 1155**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes on burning. This produces toxic and irritating fumes. Reacts violently with strong oxidants. This generates fire and explosion hazard.

Formula: C_9H_{12}
Molecular mass: 120.2
Boiling point: 165°C
Melting point: -45°C
Relative density (water = 1): 0.86
Solubility in water: very poor
Vapour pressure, kPa at 20°C: 0.25
Relative vapour density (air = 1): 4.1
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01
Flash point: 50°C c.c.
Auto-ignition temperature: 550°C
Octanol/water partition coefficient as log Pow: 3.42

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. Repeated or prolonged inhalation may cause effects on the lungs. This may result in chronic bronchitis. The substance may have effects on the central nervous system and blood. See Notes.

OCCUPATIONAL EXPOSURE LIMITS

EU-OEL: 100 mg/m^3, 20 ppm as TWA.
MAK: 100 mg/m^3, 20 ppm; peak limitation category: II(2); pregnancy risk group: C

ENVIRONMENT

The substance is harmful to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

Use of alcoholic beverages enhances the harmful effect.
Depending on the degree of exposure, periodic medical examination is suggested.
See ICSCs 1362, 1389 and 1433.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xi, N; R: 10-37-51/53; S: (2)-61

1,3-BUTADIENE **ICSC: 0017 (April 2017)**

Divinyl
Vinylethylene
Biethylene
Erythrene
Pyrrolylene
Buta-1,3-diene

CAS #: 106-99-0
UN #: 1010 (stabilized)
EC Number: 203-450-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Extremely flammable. Gas/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding) if in liquid state.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with water spray, powder, carbon dioxide, foam. In case of fire: keep cylinder cool by spraying with water.

AVOID ALL CONTACT!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Cough. Headache. Drowsiness.	Use closed system and ventilation.	Fresh air, rest. Refer for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention .
Eyes	ON CONTACT WITH LIQUID: FROSTBITE.	Wear face shield.	ON FROSTBITE: rinse with plenty of water. Refer immediately for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL

Remove all ignition sources. Evacuate danger area! Consult an expert! Personal protection: self-contained breathing apparatus. Shut off cylinder if possible. Isolate the area until the gas has dispersed. NEVER direct water jet on liquid.

STORAGE

Store only if stabilized. Fireproof. Cool. Keep in a well-ventilated room. Separated from incompatible materials and food and feedstuffs. See Chemical Dangers. See Physical Dangers. Refer to the manufacturer's instructions for proper storage conditions.

PACKAGING

Do not transport with food and feedstuffs.
Transport only if stabilized.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Contains gas under pressure; may explode if heated
Extremely flammable gas
May cause cancer
May cause genetic defects

Transportation
UN Classification
UN Hazard Class: 2.1

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,3-BUTADIENE **ICSC: 0017**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS COMPRESSED LIQUEFIED GAS WITH CHARACTERISTIC ODOUR.

Physical dangers
The gas is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated. Vapours are uninhibited and may polymerize, causing blockage of vents.

Chemical dangers
The substance can form peroxides on exposure to air, initiating explosive polymerization. The substance may polymerize due to warming. This generates fire or explosion hazard. Decomposes explosively on rapid heating under pressure. Reacts vigorously with oxidants and many other substances. This generates fire and explosion hazard. Attacks many plastics and some forms of rubber.

Formula: C_4H_6 / $CH_2=(CH)_2=CH_2$
Molecular mass: 54.1
Boiling point: -4°C
Melting point: -109°C
Relative density (water = 1): 0.6
Solubility in water, g/100ml: 0.1 (none)
Vapour pressure, kPa at 20°C: 245
Relative vapour density (air = 1): 1.9
Flash point: -76°C c.c.
Auto-ignition temperature: 414°C
Explosive limits, vol% in air: 1.1-16.3
Octanol/water partition coefficient as log Pow: 1.99

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation.

Effects of short-term exposure
The substance at very high concentrations is irritating to the eyes and respiratory tract. Rapid evaporation of the liquid may cause frostbite. Inhalation of high concentrations may cause depression of the central nervous system.

Inhalation risk
A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

Effects of long-term or repeated exposure
The substance may have effects on the bone marrow. This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 2 ppm as TWA; A2 (suspected human carcinogen).
EU-OEL: 2.2 mg/m^3, 1 ppm as TWA.
MAK: carcinogen category: 1; germ cell mutagen group: 2

ENVIRONMENT

Environmental effects from the substance have not been investigated adequately.

NOTES

The odour warning when the exposure limit value is exceeded is insufficient.
Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

ADDITIONAL INFORMATION

EC Classification
Symbol: F+, T; R: 45-46-12; S: 53-45; Note: D

1,3-DICHLOROBENZENE **ICSC: 1095 (April 2000)**

m-Dichlorobenzene
m-Phenylene dichloride

CAS #: 541-73-1
UN #: 2810
EC Number: 208-792-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 63°C explosive vapour/air mixtures may be formed.	NO open flames. Above 63°C use a closed system and ventilation.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Drowsiness. Nausea. Sore throat. Vomiting. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Diarrhoea. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from strong oxidants, aluminium and food and feedstuffs. Well closed. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,3-DICHLOROBENZENE **ICSC: 1095**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID.

Physical dangers
The vapour is heavier than air.

Chemical dangers
Decomposes on burning. This produces toxic fumes including hydrogen chloride. Reacts with strong oxidants. Reacts violently with aluminium.

Formula: $C_6H_4Cl_2$
Molecular mass: 147.00
Boiling point: 173°C
Melting point: -24.8°C
Relative density (water = 1): 1.288
Solubility in water: none
Vapour pressure, kPa at 25°C: 0.286
Relative vapour density (air = 1): 5.1
Flash point: 63°C
Octanol/water partition coefficient as log Pow: 3.53

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure
The vapour is irritating to the eyes, skin and respiratory tract. See Notes.

Inhalation risk
No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure
The substance may have effects on the kidneys and liver. See Notes.

OCCUPATIONAL EXPOSURE LIMITS

MAK: 12 mg/m^3, 2 ppm; peak limitation category: II(2); pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

Data on the toxicity of m-dichlorobenzene are limited.
See ICSCs 0037 and 1066.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 22-51/53; S: (2)-61

1,4-DICHLOROBENZENE **ICSC: 0037 (May 2018)**

p-Dichlorobenzene
PDCB

CAS #: 106-46-7
UN #: 3077
EC Number: 203-400-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 66°C explosive vapour/air mixtures may be formed. Finely dispersed particles form explosive mixtures in air.	NO open flames. Above 66°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Cough. Sore throat. Drowsiness. Headache. Nausea. Shortness of breath. Vomiting.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Diarrhoea. Further see Inhalation.	Do not eat, drink, or smoke during work.	Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants and food and feedstuffs. Provision to contain effluent from fire extinguishing. Keep in a well-ventilated room. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

Harmful if swallowed
Causes serious eye irritation
Suspected of causing cancer
Very toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 9; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,4-DICHLOROBENZENE **ICSC: 0037**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-WHITE CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
On combustion, forms toxic and corrosive fumes including hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Upon heating, toxic fumes are formed. Reacts with strong oxidants. This generates fire and explosion hazard.

Formula: $C_6H_4Cl_2$
Molecular mass: 147
Boiling point: 174°C
Melting point: 53°C
Density: 1.2 g/cm³
Solubility in water, mg/l at 20°C: 49 (practically insoluble)
Vapour pressure, Pa at 20°C: 170
Relative vapour density (air = 1): 5.08
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01
Flash point: 66°C c.c.
Explosive limits, vol% in air: 1.7-5.9
Octanol/water partition coefficient as log Pow: 3.37
Auto-ignition temperature: 640°C
Viscosity: 0.73 mPa*s at 70°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, respiratory tract and skin. The substance may cause effects on the blood. This may result in haemolytic anaemia. The substance may cause effects on the central nervous system.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance may have effects on the liver, central nervous system, blood and lungs. This may result in liver function impairment, neuropathy and anaemia. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: 12 mg/m^3, 2 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.
EU-OEL: 12 mg/m^3, 2 ppm as TWA; 60 mg/m^3, 10 ppm as STEL; (skin)

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 36-40-50/53; S: (2)-36/37-46-60-61

1,4-DIOXANE **ICSC: 0041 (November 2008)**

1,4-Diethylene dioxide
Dioxane
para-Dioxane

CAS #: 123-91-1
UN #: 1165
EC Number: 204-661-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive. Risk of fire and explosion on contact with incompatible substances. See Chemical Dangers.	NO open flames, NO sparks and NO smoking. NO contact with strong oxidizing agents. NO contact with hot surfaces. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	Use powder, alcohol-resistant foam, water spray, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Cough. Sore throat. Nausea. Dizziness. Headache. Drowsiness. Vomiting. Unconsciousness. Abdominal pain.	Use ventilation (not if powder), local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible).
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Seek medical attention if you feel unwell.

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking liquid in sealable air tight containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.

STORAGE

Fireproof. Separated from strong oxidants, strong acids and incompatible materials. Cool. Dry. Well closed. Keep in the dark. Store only if stabilized. Store in an area without drain or sewer access.

PACKAGING

Airtight.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Highly flammable liquid and vapour
Causes eye irritation
May cause respiratory irritation
Suspected of causing cancer
May be harmful if swallowed and enters airways

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,4-DIOXANE **ICSC: 0041**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers
The substance can form explosive peroxides on exposure to air. Reacts with oxidants and strong acids. Reacts violently with some catalysts.

Formula: $C_4H_8O_2$
Molecular mass: 88.1
Boiling point: 101°C
Melting point: 12°C
Relative density (water = 1): 1.03
Solubility in water: miscible
Vapour pressure, kPa at 20°C: 3.9
Relative vapour density (air = 1): 3.0
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.08
Flash point: 12°C c.c.
Auto-ignition temperature: 180°C
Explosive limits, vol% in air: 2-22.0
Octanol/water partition coefficient as log Pow: -0.27
Viscosity: 1.17 mm²/s at 25°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour and through the skin.

Effects of short-term exposure
The substance is irritating to the eyes and respiratory tract. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis. Exposure at high levels could cause lowering of consciousness.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C , on spraying or dispersing much faster.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system, kidneys and liver. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 20 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: 37 mg/m^3, 10 ppm; peak limitation category: I(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.
EU-OEL: 73 mg/m^3, 20 ppm as TWA

ENVIRONMENT

NOTES

Refer for medical attention if breathing difficulties and/or fever develop.
Check for peroxides prior to distillation; eliminate if found.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, Xn; R: 11-19-36/37-40-66; S: (2)-9-16-36/37-46; Note: D

2-HEXANONE **ICSC: 0489 (November 1998)**

Methyl n-butyl ketone
n-Butyl methyl ketone
MBK

CAS #: 591-78-6
UN #: 1224
EC Number: 209-731-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 23°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 23°C use a closed system, ventilation and explosion-proof electrical equipment.	Use alcohol-resistant foam, powder, carbon dioxide. In case of fire: keep cylinder cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Drowsiness. Headache. Nausea. Sore throat.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain. Blurred vision.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Sore throat. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: self-contained breathing apparatus. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from strong oxidants.

PACKAGING

Note: 6

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

2-HEXANONE **ICSC: 0489**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Reacts violently with oxidants. This generates fire and explosion hazard. Attacks plastics.

Formula: $C_6H_{12}O$ / $C_4H_9COCH_3$
Molecular mass: 100.2
Boiling point: 126-128°C
Melting point: -57°C
Relative density (water = 1): 0.8
Solubility in water, g/100ml at 20°C: 1.4
Vapour pressure, kPa at 20°C: 0.36
Relative vapour density (air = 1): 3.5
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01
Flash point: 23°C c.c.
Auto-ignition temperature: 423°C
Explosive limits, vol% in air: 1.2-8.0
Octanol/water partition coefficient as log Pow: 1.38

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and through the skin.

Effects of short-term exposure
The substance is irritating to the eyes and respiratory tract. The substance may cause effects on the nervous system. Exposure far above the OEL could cause unconsciousness.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C , on spraying or dispersing much faster.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the nervous system.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as TWA; 10 ppm as STEL; (skin).
MAK: 21 mg/m^3, 5 ppm; peak limitation category: II(8); skin absorption (H)

ENVIRONMENT

NOTES

Use of alcoholic beverages enhances the harmful effect.
MBK potentiates the toxicity of some other chemical substances like chloroform, carbon tetrachloride, ethanol.
Depending on the degree of exposure, periodic medical examination is suggested.

ADDITIONAL INFORMATION

EC Classification
Symbol: T; R: 10-48/23-62-67; S: (1/2)-36/37-45

Material Safety Data Sheet
p-Ethyltoluene, 98%

ACC# 35092

Section 1 - Chemical Product and Company Identification

MSDS Name: p-Ethyltoluene, 98%
Catalog Numbers: AC119010000, AC119010050, AC119010100, AC119010250, AC119010500
Synonyms: 4-Ethyltoluene; 1-Ethyl-4-methylbenzene; 1-Methyl-4-ethylbenzene; p-Ethyltoluene.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
622-96-8	p-Ethyltoluene	98	210-761-2

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear very slight yellow liquid. Flash Point: 36 deg C.
Warning! Flammable liquid and vapor. May cause eye and skin irritation. May cause respiratory tract irritation. May cause central nervous system depression. May cause lung damage. The toxicological properties of this material have not been fully investigated.
Target Organs: Central nervous system, lungs.

Potential Health Effects

Eye: May cause chemical conjunctivitis and corneal damage.
Skin: May be harmful if absorbed through the skin. May cause irritation and dermatitis. May cause cyanosis of the extremities.
Ingestion: Aspiration hazard. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. Ingestion of large amounts may cause CNS depression. May cause lung damage.
Inhalation: May cause respiratory tract irritation. Aspiration may lead to pulmonary edema. May be harmful if inhaled. Vapors may cause dizziness or suffocation. May cause burning sensation in the chest.
Chronic: Effects may be delayed.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.

Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid. Do NOT use mouth-to-mouth resuscitation.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than water and a fire may be spread by the use of water. Flammable liquid and vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Water may be ineffective. Do NOT use straight streams of water.
Flash Point: 36 deg C (96.80 deg F)
Autoignition Temperature: 475 deg C (887.00 deg F)
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 1; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid breathing vapor or mist.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
p-Ethyltoluene	none listed	none listed	none listed

OSHA Vacated PELs: p-Ethyltoluene: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear very slight yellow
Odor: Toluene-like
pH: Not available.
Vapor Pressure: 3 mm Hg @ 25 deg C
Vapor Density: 4.15 (air=1)
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 162 deg C @ 760 mm Hg
Freezing/Melting Point:-62 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:.8600 g/cm3
Molecular Formula:C9H12
Molecular Weight:120.19

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Ignition sources, excess heat.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 622-96-8: XT2550000
LD50/LC50:
CAS# 622-96-8:
Inhalation, mouse: LC50 = 54000 mg/m3/4H;
Oral, rat: LD50 = 4850 mg/kg;
.

Carcinogenicity:
CAS# 622-96-8: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: See actual entry in RTECS for complete information.
Mutagenicity: See actual entry in RTECS for complete information.

Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	FLAMMABLE LIQUIDS, N.O.S.	FLAMMABLE LIQUID NOS (P-ETHYLTOLUENE)
Hazard Class:	3	3
UN Number:	UN1993	UN1993
Packing Group:	III	III
Additional Info:		FP 36 C

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 622-96-8 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 622-96-8: Effective 4/29/83, Sunset 4/29/93
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 622-96-8 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

XN

Risk Phrases:

R 10 Flammable.

R 65 Harmful: may cause lung damage if swallowed.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.

WGK (Water Danger/Protection)

CAS# 622-96-8: No information available.

Canada - DSL/NDSL

CAS# 622-96-8 is listed on Canada's NDSL List.

Canada - WHMIS

This product has a WHMIS classification of B2.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 622-96-8 is not listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/02/1997
Revision #8 Date: 9/26/2007

p-CYMENE **ICSC: 0617 (November 1997)**

1-Methyl-4-isopropylbenzene
Dolcymene
Camphogen

CAS #: 99-87-6
UN #: 2046
EC Number: 202-796-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 47°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 47°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Dizziness. Drowsiness. Vomiting.	Use ventilation.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Wear protective gloves when administering first aid.
Eyes	Redness.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Diarrhoea. Drowsiness. Headache. Nausea. Vomiting. Unconsciousness.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Rest. Refer for medical attention .

SPILLAGE DISPOSAL

Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance.

STORAGE

Fireproof.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

p-CYMENE **ICSC: 0617**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air.

Chemical dangers
Reacts with oxidants. Attacks rubber.

Formula: $C_{10}H_{14}$ / $CH_3C_6H_4CH(CH_3)_2$
Molecular mass: 134.2
Boiling point: 177°C
Melting point: -68°C
Relative density (water = 1): 0.85
Solubility in water, g/100ml at 25°C: 0.002
Vapour pressure, Pa at 20°C: 200
Relative vapour density (air = 1): 4.62
Flash point: 47°C c.c.
Auto-ignition temperature: 435°C
Explosive limits, vol% in air: 0.7-5.6
Octanol/water partition coefficient as log Pow: 4.1

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes and skin. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

Inhalation risk
No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking.

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

NOTES

ADDITIONAL INFORMATION

EC Classification

METHYL ISOBUTYL KETONE **ICSC: 0511 (July 1997)**

MIBK
4-Methyl-2-pentanone
Isopropylacetone
Hexone

CAS #: 108-10-1
UN #: 1245
EC Number: 203-550-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Diarrhoea. Dizziness. Headache. Nausea. Sore throat. Unconsciousness. Vomiting. Weakness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from strong oxidants. Well closed.

PACKAGING

Airtight.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

METHYL ISOBUTYL KETONE **ICSC: 0511**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour mixes well with air, explosive mixtures are easily formed.

Chemical dangers
The substance can form explosive peroxides on exposure to air. Reacts violently with strong oxidants and strong reducing agents.

Formula: $C_6H_{12}O$ / $CH_3COCH_2CH(CH_3)_2$
Molecular mass: 100.2
Boiling point: 117-118°C
Melting point: -84.7°C
Relative density (water = 1): 0.80
Solubility in water, g/100ml at 20°C: 1.91
Vapour pressure, kPa at 20°C: 2.1
Relative vapour density (air = 1): 3.45
Flash point: 14°C c.c.
Auto-ignition temperature: 460°C
Explosive limits, vol% in air: 1.4-7.5
Octanol/water partition coefficient as log Pow: 1.38

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Effects of short-term exposure
The substance and the vapour are irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system at high concentrations. This may result in narcosis.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 20 ppm as TWA; 75 ppm as STEL; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.
MAK: 83 mg/m^3, 20 ppm; peak limitation category: I(2); skin absorption (H); pregnancy risk group: C.
EU-OEL: 83 mg/m^3, 20 ppm as TWA; 208 mg/m^3, 50 ppm as STEL

ENVIRONMENT

NOTES

Check for peroxides prior to distillation; eliminate if found.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, Xn; R: 11-20-36/37-66; S: (2)-9-16-29; Note: 6

ACETONE **ICSC: 0087 (April 2009)**

2-Propanone
Dimethyl ketone
Methyl ketone

CAS #: 67-64-1
UN #: 1090
EC Number: 200-662-2

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive. Heating will cause rise in pressure with risk of bursting.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	Use powder, alcohol-resistant foam, water, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Cough. Confusion. Headache. Dizziness. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain. Blurred vision.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible). Refer for medical attention.
Ingestion	Nausea. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Remove all ignition sources. Personal protection: filter respirator for organic gases and vapours of low boiling point adapted to the airborne concentration of the substance. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.

STORAGE

Fireproof. Separated from : see Chemical Dangers. Store in an area without drain or sewer access.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Highly flammable liquid and vapour
Causes eye irritation

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

ACETONE **ICSC: 0087**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers
Contact with strong oxidants such as acetic acid, nitric acid and hydrogen peroxide generates explosive peroxides. Reacts with chloroform and bromoform under basic conditions. This generates fire and explosion hazard. Attacks plastics.

Formula: C_3H_6O / CH_3-CO-CH_3
Molecular mass: 58.1
Boiling point: 56°C
Melting point: -95°C
Relative density (water = 1): 0.8
Solubility in water: miscible
Vapour pressure, kPa at 20°C: 24
Relative vapour density (air = 1): 2.0
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2
Flash point: -18°C c.c.
Auto-ignition temperature: 465°C
Explosive limits, vol% in air: 2.2-13
Octanol/water partition coefficient as log Pow: -0.24
Viscosity: 0.34 mm²/s at 40°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation.

Effects of short-term exposure
The substance is irritating to the eyes and respiratory tract. Exposure at high levels could cause lowering of consciousness.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C , on spraying or dispersing much faster.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. Repeated or prolonged contact with skin may cause dryness and cracking.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 250 ppm as TWA; 500 ppm as STEL; BEI issued; A4 (not classifiable as a human carcinogen).
MAK: 1200 mg/m^3, 500 ppm; peak limitation category: I(2); pregnancy risk group: B.
EU-OEL: 1210 mg/m^3, 500 ppm as TWA

ENVIRONMENT

NOTES

Use of alcoholic beverages enhances the harmful effect.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, Xi; R: 11-36-66-67; S: (2)-9-16-26

ACRYLONITRILE **ICSC: 0092 (March 2001)**

Cyanoethylene
2-Propenenitrile
Vinyl cyanide

CAS #: 107-13-1
UN #: 1093
EC Number: 203-466-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive. Risk of fire and explosion on contact with strong bases or strong acids.	NO open flames, NO sparks and NO smoking. NO contact with strong bases or strong acids. Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non-sparking handtools.	Use water spray, powder, alcohol-resistant foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Dizziness. Headache. Nausea. Shortness of breath. Vomiting. Weakness. Convulsions. Chest tightness.	Use closed system or ventilation.	Fresh air, rest. Refer for medical attention. See Notes.
Skin	MAY BE ABSORBED! Redness. Pain. Blisters. Further see Inhalation.	Protective gloves. Protective clothing.	First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention .

SPILLAGE DISPOSAL

Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Ventilation. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from strong oxidants, strong bases and food and feedstuffs. Cool. Keep in the dark. Ventilation along the floor. Store only if stabilized.

PACKAGING

Unbreakable packaging.
Put breakable packaging into closed unbreakable container.
Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 3; UN Subsidiary Risks: 6.1; UN Pack Group: I

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

ACRYLONITRILE **ICSC: 0092**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS OR PALE YELLOW LIQUID WITH PUNGENT ODOUR.

Physical dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers
The substance polymerizes due to heating and under the influence of light and bases. This generates fire or explosion hazard. Decomposes on heating. This produces toxic fumes including hydrogen cyanide and nitrogen oxides. Reacts violently with strong acids and strong oxidants. Attacks plastics and rubber.

Formula: C_3H_3N / CH_2=CH-CN
Molecular mass: 53.1
Boiling point: 77°C
Melting point: -84°C
Relative density (water = 1): 0.8
Solubility in water, g/100ml at 20°C: 7
Vapour pressure, kPa at 20°C: 11.0
Relative vapour density (air = 1): 1.8
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.05
Flash point: -1°C c.c.
Auto-ignition temperature: 481°C
Explosive limits, vol% in air: 3.0-17.0
Octanol/water partition coefficient as log Pow: 0.25

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure
The substance and the vapour are irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause death. The effects may be delayed. See Notes. Medical observation is indicated.

Inhalation risk
A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact may cause skin sensitization. The substance may have effects on the central nervous system and liver. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 2 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: carcinogen category: 2; sensitization of skin (SH); skin absorption (H)

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Exposure to the substance will result in cyanide formation.
See ICSC 0671.
Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.
The odour warning when the exposure limit value is exceeded is insufficient.
Rinse contaminated clothing with plenty of water because of fire hazard.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, T, N; R: 45-11-23/24/25-37/38-41-43-51/53; S: 9-16-53-45-61; Note: D, E

BENZENE **ICSC: 0015 (November 2016)**

Cyclohexatriene
Benzol

CAS #: 71-43-2
UN #: 1114
EC Number: 200-753-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive. Risk of fire and explosion. See Chemical Dangers.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools. Prevent build-up of electrostatic charges (e.g., by grounding).	Use foam, water spray, carbon dioxide, powder. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Dizziness. Drowsiness. Headache. Nausea. Shortness of breath. Convulsions. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Dry skin. Redness. Pain. Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Sore throat. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Remove all ignition sources. Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from food and feedstuffs, oxidants and halogens. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Highly flammable liquid and vapour
May be fatal if swallowed and enters airways
Causes skin irritation
Causes serious eye irritation
May cause genetic defects
May cause cancer
Causes damage to the bone marrow and the central nervous system through prolonged or repeated exposure
Harmful to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

BENZENE **ICSC: 0015**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
Reacts violently with oxidants, nitric acid, sulfuric acid and halogens. This generates fire and explosion hazard. Attacks plastics and rubber.

Formula: C_6H_6
Molecular mass: 78.1
Boiling point: 80°C
Melting point: 6°C
Relative density (water = 1): 0.88
Solubility in water, g/100ml at 25°C: 0.18
Vapour pressure, kPa at 20°C: 10
Relative vapour density (air = 1): 2.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2
Flash point: -11°C c.c.
Auto-ignition temperature: 498°C
Explosive limits, vol% in air: 1.2-8.0
Octanol/water partition coefficient as log Pow: 2.13

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. This may result in lowering of consciousness. Exposure far above the OEL could cause unconsciousness and death. If swallowed the substance easily enters the airways and could result in aspiration pneumonitis.

Inhalation risk
A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system and immune system. The substance may have effects on the bone marrow. This may result in anaemia. This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells. See Notes.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.5 ppm as TWA; 2.5 ppm as STEL; (skin); A1 (confirmed human carcinogen); BEI issued.
EU-OEL: 3.25 mg/m^3, 1 ppm as TWA; (skin).
MAK: carcinogen category: 1; germ cell mutagen group: 3A; skin absorption (H)

ENVIRONMENT

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

Use of alcoholic beverages enhances the harmful effect.
Depending on the degree of exposure, periodic medical examination is suggested.
The odour warning when the exposure limit value is exceeded is insufficient.
Benzene causes acute myeloid leukaemia/acute non-lymphocytic leukaemia. Also, a positive association has been observed between exposure to benzene and acute lymphocytic leukaemia, chronic lymphocytic leukaemia, multiple myeloma, and non-Hodgkin lymphoma.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, T; R: 45-46-11-36/38-48/23/24/25-65; S: 53-45; Note: E

BENZYL CHLORIDE **ICSC: 0016 (October 2001)**

alpha-Chlorotoluene
(Chloromethyl)benzene
Tolyl chloride

CAS #: 100-44-7
UN #: 1738
EC Number: 202-853-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 67°C explosive vapour/air mixtures may be formed.	NO open flames. Above 67°C use a closed system and ventilation.	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Burning sensation. Cough. Nausea. Headache. Shortness of breath. Dizziness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Watering of the eyes. Redness. Pain. Blurred vision. Severe deep burns.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Vomiting. Burning sensation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in covered non-metallic containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from food and feedstuffs and incompatible materials. See Chemical Dangers. Dry. Ventilation along the floor. Store only if stabilized.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Subsidiary Risks: 8; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

BENZYL CHLORIDE **ICSC: 0016**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH PUNGENT ODOUR.

Physical dangers

Chemical dangers
The substance polymerizes under the influence of all common metals except nickel and lead. This produces corrosive fumes (hydrogen chloride - see ICSC 0163). This generates fire or explosion hazard. On combustion, forms toxic and corrosive fumes of hydrogen chloride. Reacts vigorously with strong oxidants. Attacks many metals in the presence of water.

Formula: C_7H_7Cl / $C_6H_5CH_2Cl$
Molecular mass: 126.6
Boiling point: 179°C
Melting point: ~-43°C
Relative density (water = 1): 1.1
Solubility in water, g/100ml: <0.1 (none)
Vapour pressure, Pa at 20°C: 120
Relative vapour density (air = 1): 4.4
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00
Flash point: 67°C c.c.
Auto-ignition temperature: 585°C
Explosive limits, vol% in air: 1.1-14.0
Octanol/water partition coefficient as log Pow: 2.3

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is corrosive to the eyes. The vapour is irritating to the eyes, skin and respiratory tract. Inhalation of the vapour or aerosol may cause lung oedema. See Notes. The substance may cause effects on the central nervous system. This may result in unconsciousness.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C , on spraying much faster.

Effects of long-term or repeated exposure
The substance may have effects on the liver and kidneys. This may result in tissue lesions. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

MAK: skin absorption (H); carcinogen category: 2

ENVIRONMENT

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.
Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered.
An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.

ADDITIONAL INFORMATION

EC Classification
Symbol: T; R: 45-22-23-37/38-41-48/22; S: 53-45; Note: E

BROMODICHLOROMETHANE **ICSC: 0393 (April 2006)**

Dichlorobromomethane
Methane, bromodichloro-

CAS #: 75-27-4

EC Number: 200-856-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media.

AVOID ALL CONTACT!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Effects of long-term or repeated exposure.	Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL

STORAGE

Separated from strong oxidants, strong bases and magnesium.
Ventilation along the floor.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

Harmful if swallowed
Suspected of causing cancer
May cause damage to liver and kidneys through prolonged or repeated exposure if swallowed

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

BROMODICHLOROMETHANE **ICSC: 0393**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID.

Physical dangers
The vapour is heavier than air.

Chemical dangers
Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive gases including hydrogen bromide and hydrogen chloride. Reacts with strong bases, strong oxidants and magnesium.

Formula: $CHBrCl_2$
Molecular mass: 163.8
Boiling point: 90°C
Melting point: -57°C
Density: 1.9 g/cm³
Solubility in water, g/100ml at 20°C: 0.45 (poor)
Vapour pressure, kPa at 20°C: 6.6
Relative vapour density (air = 1): 5.6
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.3
Octanol/water partition coefficient as log Pow: 2

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by ingestion.

Effects of short-term exposure

Inhalation risk
A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Ingestion may cause effects on the kidneys and liver. This may result in impaired functions. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

MAK: skin absorption (H); carcinogen category: 2; germ cell mutagen group: 3B

ENVIRONMENT

NOTES

Bromodichloromethane can be found in chlorinated water.
Health effects of exposure to the substance have not been investigated adequately other than by ingestion.

ADDITIONAL INFORMATION

EC Classification

BROMOFORM **ICSC: 0108 (April 2009)**

Tribromomethane
Methenyl tribromide
Methyl tribromide

CAS #: 75-25-2
UN #: 2515
EC Number: 200-854-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Further see Ingestion.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	Redness. See Ingestion.	Protective gloves. Protective clothing.	Rinse and then wash skin with water and soap. Seek medical attention if you feel unwell.
Eyes	Watering of the eyes. Redness. Pain.	Wear safety spectacles or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Headache. Dizziness. Drowsiness.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.

STORAGE

Separated from strong bases, oxidants, metals and food and feedstuffs. Keep in the dark. Ventilation along the floor. Store only if stabilized. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

Harmful if swallowed
Causes skin and eye irritation
May cause respiratory irritation
May cause damage to the nervous system and liver
May cause damage to liver through prolonged or repeated exposure
Harmful to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

BROMOFORM **ICSC: 0108**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR. TURNS YELLOW ON EXPOSURE TO LIGHT AND AIR.

Physical dangers
No data.

Chemical dangers
Decomposes on heating. This produces toxic and corrosive fumes including hydrogen bromide and bromine. Reacts violently with oxidants and bases. Reacts with powdered metals. This generates fire and explosion hazard. Attacks some forms of plastic, rubber and coatings.

Formula: $CHBr_3$
Molecular mass: 252.7
Boiling point: 149.5°C
Melting point: 8.3°C
Relative density (water = 1): 2.9
Solubility in water, g/100ml at 20°C: 0.1 (poor)
Vapour pressure, kPa at 20°C: 0.67
Relative vapour density (air = 1): 8.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.05
Octanol/water partition coefficient as log Pow: 2.38
Viscosity: 0.74 mm²/s at 15°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system.

Inhalation risk
A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance may have effects on the liver and kidneys.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.5 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: carcinogen category: 3

ENVIRONMENT

The substance is harmful to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES

An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 22-23-36/38-51/53; S: (1/2)-28-45-61-63

CARBON DISULFIDE **ICSC: 0022 (April 2000)**

Carbon bisulfide
Carbon sulfide
Carbon disulphide

CAS #: 75-15-0
UN #: 1131
EC Number: 200-843-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Many reactions may cause fire or explosion. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. NO contact with hot surfaces. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Do NOT expose to friction or shock.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Headache. Nausea. Shortness of breath. Vomiting. Weakness. Irritability. Hallucinations.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Dry skin. Redness. Further see Inhalation.	Protective gloves. Protective clothing.	First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Further see Inhalation.	Do not eat, drink, or smoke during work.	Give nothing to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Remove all ignition sources. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.

STORAGE

Fireproof. Separated from oxidants and food and feedstuffs. Cool. Store in an area without drain or sewer access.

PACKAGING

Airtight.
Unbreakable packaging.
Put breakable packaging into closed unbreakable container.
Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 3; UN Subsidiary Risks: 6.1; UN Pack Group: I

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

CARBON DISULFIDE **ICSC: 0022**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
May decompose explosively on shock, friction or concussion. May explode on heating. The substance may ignite spontaneously on contact with hot surfaces and air. This produces toxic fumes of sulfur dioxide (see ICSC 0074). Reacts violently with oxidants. This generates fire and explosion hazard. Attacks some forms of plastic, rubber and coatings.

Formula: CS_2
Molecular mass: 76.1
Boiling point: 46°C
Melting point: -111°C
Relative density (water = 1): 1.26
Solubility in water, g/100ml at 20°C: 0.2
Vapour pressure, kPa at 25°C: 48
Relative vapour density (air = 1): 2.63
Flash point: -30°C c.c.
Auto-ignition temperature: 90°C
Explosive limits, vol% in air: 1-50
Octanol/water partition coefficient as log Pow: 1.84

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure could cause lowering of consciousness. Exposure between 200 and 500 ppm could cause death.

Inhalation risk
A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the cardiovascular system and nervous system. This may result in coronary heart disease, severe neurobehavioural effects, polyneuritis and psychoses. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1 ppm as TWA; (skin); A4 (not classifiable as a human carcinogen); BEI issued.
MAK: 16 mg/m^3, 5 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: B.
EU-OEL: 15 mg/m^3, 5 ppm as TWA; (skin)

ENVIRONMENT

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, T; R: 11-36/38-48/23-62-63; S: (1/2)-16-33-36/37-45

CARBON TETRACHLORIDE **ICSC: 0024 (November 2000)**

Tetrachloromethane
Tetrachlorocarbon
Tetra

CAS #: 56-23-5
UN #: 1846
EC Number: 200-262-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Dizziness. Drowsiness. Headache. Nausea. Vomiting.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from food and feedstuffs and metals. See Chemical Dangers. Ventilation along the floor. Cool.

PACKAGING

Unbreakable packaging.
Put breakable packaging into closed unbreakable container.
Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

CARBON TETRACHLORIDE **ICSC: 0024**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air.

Chemical dangers
Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive fumes of hydrogen chloride (see ICSC 0163), chlorine (see ICSC 0126) and phosgene (see ICSC 0007). Reacts with some metals such as aluminium, magnesium and zinc. This generates fire and explosion hazard.

Formula: CCl_4
Molecular mass: 153.8
Boiling point: 76.5°C
Melting point: -23°C
Relative density (water = 1): 1.59
Solubility in water, g/100ml at 20°C: 0.1 (poor)
Vapour pressure, kPa at 20°C: 12.2
Relative vapour density (air = 1): 5.3
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.5
Octanol/water partition coefficient as log Pow: 2.64

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes. The substance may cause effects on the liver, kidneys and central nervous system. This may result in unconsciousness. Medical observation is indicated.

Inhalation risk
A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as TWA; 10 ppm as STEL; (skin); A2 (suspected human carcinogen).
MAK: 3.2 mg/m^3, 0.5 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.
EU-OEL: 6.4 mg/m^3, 1 ppm as TWA; 32 mg/m^3, 5 ppm as STEL; (skin)

ENVIRONMENT

The substance is harmful to aquatic organisms. Avoid release to the environment because of its impact on the ozone layer.

NOTES

Use of alcoholic beverages enhances the harmful effect.
Depending on the degree of exposure, periodic medical examination is suggested.
The odour warning when the exposure limit value is exceeded is insufficient.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 23/24/25-40-48/23-52/53-59; S: (1/2)-23-36/37-45-59-61

CHLOROBENZENE **ICSC: 0642 (November 2003)**

Benzene chloride
Chlorobenzol
Phenyl chloride

CAS #: 108-90-7
UN #: 1134
EC Number: 203-628-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Gives off irritating or toxic fumes (or gases) in a fire. Above 27°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 27°C use a closed system, ventilation and explosion-proof electrical equipment.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Drowsiness. Headache. Nausea. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Dry skin.	Protective gloves.	Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Remove all ignition sources. Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from strong oxidants.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

CHLOROBENZENE **ICSC: 0642**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes on heating and on contact with hot surfaces and flames. This produces toxic and corrosive fumes. Reacts violently with strong oxidants. This generates fire and explosion hazard. Attacks rubber and some plastics.

Formula: C_6H_5Cl
Molecular mass: 112.6
Boiling point: 132°C
Melting point: -45°C
Relative density (water = 1): 1.11
Solubility in water, g/100ml at 20°C: 0.05
Vapour pressure, kPa at 20°C: 1.17
Relative vapour density (air = 1): 3.88
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.03
Flash point: 27°C c.c.
Auto-ignition temperature: 590°C
Explosive limits, vol% in air: 1.3-11
Octanol/water partition coefficient as log Pow: 2.18/2.84

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes and skin. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. This may result in lowering of consciousness.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the liver and kidneys.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.
MAK: 23 mg/m^3, 5 ppm; peak limitation category: II(2); pregnancy risk group: C.
EU-OEL: 23 mg/m^3, 5 ppm as TWA; 70 mg/m^3, 15 ppm as STEL

ENVIRONMENT

The substance is harmful to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 10-20-51/53; S: (2)-24/25-61

1-CHLOROETHANE **ICSC: 0132 (October 2000)**

Ethyl chloride
Monochloroethane

CAS #: 75-00-3
UN #: 1037
EC Number: 200-830-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Extremely flammable. Gives off irritating or toxic fumes (or gases) in a fire. Gas/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding) if in liquid state. Use non-sparking handtools.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with powder, carbon dioxide. In case of fire: keep cylinder cool by spraying with water.

STRICT HYGIENE!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Dizziness. Lethargy. Headache. Abdominal cramps.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves. Protective clothing.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain. Blurred vision.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Personal protection: self-contained breathing apparatus. Ventilation. Do NOT let this chemical enter the environment.	**According to UN GHS Criteria**
STORAGE	**Transportation**
Fireproof.	**UN Classification**
PACKAGING	UN Hazard Class: 2.1
Special insulated cylinder. Special fittings.	

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1-CHLOROETHANE **ICSC: 0132**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS COMPRESSED LIQUEFIED GAS WITH CHARACTERISTIC ODOUR.

Physical dangers
The gas is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers
Decomposes on heating and on burning. This produces toxic gases of hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007).

Formula: C_2H_5Cl / CH_3CH_2Cl
Molecular mass: 64.5
Boiling point: 12.5°C
Melting point: -138°C
Relative density (water = 1): 0.918
Solubility in water, g/100ml at 20°C: 0.574
Vapour pressure, kPa at 20°C: 133.3
Relative vapour density (air = 1): 2.22
Flash point: -50°C c.c.
Auto-ignition temperature: 519°C
Explosive limits, vol% in air: 3.6-14.8
Octanol/water partition coefficient as log Pow: 1.54

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation.

Effects of short-term exposure
The substance is mildly irritating to the eyes, skin and respiratory tract. Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause unconsciousness, cardiac dysrhythmia and death.

Inhalation risk
A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

TLV: 100 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: skin absorption (H); carcinogen category: 3.
EU-OEL: 268 mg/m^3, 100 ppm as TWA

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Use of alcoholic beverages enhances the harmful effect.
Rinse contaminated clothing with plenty of water because of fire hazard.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.
Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

ADDITIONAL INFORMATION

EC Classification
Symbol: F+, Xn; R: 12-40-52/53; S: (2)-9-16-33-36/37-61

CHLOROFORM **ICSC: 0027 (November 2000)**

Trichloromethane
Methane trichloride
Formyl trichloride

CAS #: 67-66-3
UN #: 1888
EC Number: 200-663-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. See Notes. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Cough. Dizziness. Drowsiness. Headache. Nausea. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	Redness. Pain. Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Rest. Refer for medical attention .

SPILLAGE DISPOSAL

Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from food and feedstuffs and incompatible materials. See Chemical Dangers. Ventilation along the floor.

PACKAGING

Unbreakable packaging.
Put breakable packaging into closed unbreakable container.
Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

CHLOROFORM **ICSC: 0027**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
VOLATILE COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air.

Chemical dangers
Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive fumes of hydrogen chloride (see ICSC 0163), phosgene (see ICSC 0007) and chlorine (see ICSC 0126). Reacts violently with strong bases, strong oxidants and some metals such as aluminium, magnesium and zinc. This generates fire and explosion hazard. Attacks plastics, rubber and coatings.

Formula: $CHCl_3$
Molecular mass: 119.4
Boiling point: 62°C
Melting point: -64°C
Solubility in water, g/100ml at 20°C: 0.8
Vapour pressure, kPa at 20°C: 212
Relative vapour density (air = 1): 4.12
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.7
Octanol/water partition coefficient as log Pow: 1.97

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes. The substance may cause effects on the central nervous system, liver and kidneys. The effects may be delayed. Medical observation is indicated.

Inhalation risk
A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the liver and kidneys. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: 2.5 mg/m^3, 0.5 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.
EU-OEL: 10 mg/m^3, 2 ppm as TWA; (skin)

ENVIRONMENT

The substance is toxic to aquatic organisms.

NOTES

Turns combustible on addition of small amounts of a flammable substance or an increase in the oxygen content of the air.
Use of alcoholic beverages enhances the harmful effect.
Depending on the degree of exposure, periodic medical examination is suggested.
The odour warning when the exposure limit value is exceeded is insufficient.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn; R: 22-38-40-48/20/22; S: (2)-36/37

METHYL CHLORIDE **ICSC: 0419 (June 2015)**

Chloromethane
Monochloromethane

CAS #: 74-87-3
UN #: 1063
EC Number: 200-817-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Heating will cause rise in pressure with risk of bursting. Gas/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non-sparking handtools.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with water spray. In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position.

STRICT HYGIENE!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Staggering gait. Dizziness. Headache. Nausea. Vomiting. Convulsions. Unconsciousness. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves. Protective clothing.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention .
Eyes	See Skin.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	
Ingestion			

SPILLAGE DISPOSAL

Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Ventilation. NEVER direct water jet on liquid.

STORAGE

Fireproof. Ventilation along the floor.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Extremely flammable gas
Contains gas under pressure; may explode if heated
Suspected of damaging fertility or the unborn child
May cause damage to central nervous system if inhaled
May cause damage to central nervous system through prolonged or repeated exposure if inhaled

Transportation
UN Classification
UN Hazard Class: 2.1

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

METHYL CHLORIDE **ICSC: 0419**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUEFIED GAS.

Physical dangers
The gas is heavier than air and may travel along the ground; distant ignition possible. The gas is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen. See Notes.

Chemical dangers
Decomposes on burning. This produces toxic and corrosive fumes including hydrogen chloride and phosgene. Reacts violently with powdered aluminium, powdered zinc, aluminium trichloride and ethylene. This generates fire and explosion hazard. Attacks many metals in the presence of moisture.

Formula: CH_3Cl
Molecular mass: 50.5
Boiling point: -23.7°C
Melting point: -97°C
Relative density (water = 1): 0.91
Solubility in water, g/100ml at 25°C: 0.5
Vapour pressure, kPa at 25°C: 573
Relative vapour density (air = 1): 2.47
Flash point: Flammable gas
Auto-ignition temperature: 632°C
Explosive limits, vol% in air: 8.1-17.4
Octanol/water partition coefficient as log Pow: 0.91
Viscosity: 0.1834 cP at 20°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and through the skin.

Effects of short-term exposure
The liquid may cause frostbite. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause liver, cardiovascular system and kidney damage. Exposure could cause unconsciousness. Medical observation is indicated. The effects may be delayed.

Inhalation risk
A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

Effects of long-term or repeated exposure
The substance may have effects on the central nervous system. This may result in effects measured using behavioural tests. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 50 ppm as TWA; 100 ppm as STEL; (skin); A4 (not classifiable as a human carcinogen).
MAK: 21 mg/m^3, 10 ppm; peak limitation category: II(1); pregnancy risk group: D.
EU-OEL: 42 mg/m^3, 20 ppm as TWA

ENVIRONMENT

NOTES

Following intoxication patient should be observed carefully for 48 hours.
Check oxygen content before entering area.

ADDITIONAL INFORMATION

EC Classification
Symbol: F+, Xn; R: 12-40-48/20; S: (2)-9-16-33

SAFETY DATA SHEET

Creation Date 22-Sep-2009 **Revision Date** 23-Jan-2018 **Revision Number** 3

1. Identification

Product Name **cis-1,2-Dichloroethylene**

Cat No. : **AC113380000; AC113380025; AC113380100; AC113380500**

Synonyms cis-Acetylene dichloride.

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 2
Acute oral toxicity	Category 4
Acute Inhalation Toxicity - Vapors	Category 4
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Danger

Hazard Statements
Highly flammable liquid and vapor
Harmful if swallowed
Harmful if inhaled

Causes serious eye irritation
Causes skin irritation
May cause respiratory irritation

Precautionary Statements
Prevention
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Avoid breathing dust/fume/gas/mist/vapors/spray
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Take precautionary measures against static discharge
Do not eat, drink or smoke when using this product
Response
Call a POISON CENTER or doctor/physician if you feel unwell
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Skin
IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation occurs: Get medical advice/attention
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
Rinse mouth
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Fire
Explosion risk in case of fire
Fight fire with normal precautions from a reasonable distance
Evacuate area
Storage
Store in a well-ventilated place. Keep cool
Store in a closed container
Store locked up
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
cis-1,2-Dichloroethylene	156-59-2	97

4. First-aid measures

Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Get medical attention.
Inhalation	Remove to fresh air. Get medical attention. If not breathing, give artificial respiration.
Ingestion	Do NOT induce vomiting. Get medical attention.
Most important symptoms and effects	Difficulty in breathing. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Water spray. Carbon dioxide (CO_2). Dry chemical. Water mist may be used to cool closed containers. Chemical foam. Water mist may be used to cool closed containers.
Unsuitable Extinguishing Media	No information available
Flash Point	6 °C / 42.8 °F
Method -	No information available
Autoignition Temperature	440 °C / 824 °F

Explosion Limits

Upper	12.80%
Lower	9.70%
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Flammable. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Vapors may form explosive mixtures with air.

Hazardous Combustion Products
Carbon monoxide (CO). Carbon dioxide (CO_2). Hydrogen chloride gas.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	3	0	N/A

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment as required. Remove all sources of ignition. Take precautionary measures against static discharges. Avoid contact with skin, eyes or clothing.
Environmental Precautions	See Section 12 for additional Ecological Information. Do not flush into surface water or sanitary sewer system.
Methods for Containment and Clean Up	Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling

Ensure adequate ventilation. Wear personal protective equipment/face protection. Use spark-proof tools and explosion-proof equipment. Use only non-sparking tools. Avoid contact with skin, eyes or clothing. Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded.

Storage

Keep in a dry, cool and well-ventilated place. Refer product specification and/or product label for specific storage temperature requirement. Keep container tightly closed. Keep away from heat, sparks and flame. Flammables area. Keep container tightly closed in a dry and well-ventilated place.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
cis-1,2-Dichloroethylene	TWA: 200 ppm			TWA: 200 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

Engineering Measures

Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection

Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection

No protective equipment is needed under normal use conditions.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	aromatic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-80 °C / -112 °F
Boiling Point/Range	60 °C / 140 °F @ 760 mmHg
Flash Point	6 °C / 42.8 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	12.80%
Lower	9.70%
Vapor Pressure	201 mmHg @ 25 °C
Vapor Density	3.34 (Air = 1.0)
Specific Gravity	1.280
Solubility	No information available
Partition coefficient; n-octanol/water	No data available

Autoignition Temperature	440 °C / 824 °F
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C2 H2 Cl2
Molecular Weight	96.94

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Keep away from open flames, hot surfaces and sources of ignition. Exposure to air. Exposure to light. Incompatible products. Exposure to moist air or water.

Incompatible Materials Bases

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2), Hydrogen chloride gas

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes, respiratory system and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
cis-1,2-Dichloroethylene	156-59-2	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Do not empty into drains. Do not flush into surface water or sanitary sewer system. Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
cis-1,2-Dichloroethylene	Not listed	Not listed	EC50 = 721 mg/L 5 min EC50 = 905 mg/L 30 min	Not listed

Persistence and Degradability Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN1150
Proper Shipping Name 1,2-DICHLOROETHYLENE
Hazard Class 3
Packing Group II

TDG

UN-No UN1150
Proper Shipping Name 1,2-DICHLOROETHYLENE
Hazard Class 3
Packing Group II

IATA

UN-No UN1150
Proper Shipping Name 1,2-DICHLOROETHYLENE
Hazard Class 3
Packing Group II

IMDG/IMO

UN-No UN1150
Proper Shipping Name 1,2-DICHLOROETHYLENE
Hazard Class 3
Packing Group II

15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
cis-1,2-Dichloroethylene	156-59-2	X	ACTIVE	-

Legend:
TSCA - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
cis-1,2-Dichloroethylene	156-59-2	-	X	205-859-7	-	X	X	X	KE-10124

U.S. Federal Regulations

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
cis-1,2-Dichloroethylene	X	-	X	-	-

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 22-Sep-2009
Revision Date 23-Jan-2018
Print Date 23-Jan-2018
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

TCI AMERICA

SAFETY DATA SHEET

Revision number: 3
Revision date: 11/10/2015

1. IDENTIFICATION

Product name: cis-1,3-Dichloropropene
Product code: D2792

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborgate Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:
Acute Toxicity - Oral [Category 3]
Acute Toxicity - Dermal [Category 3]
Acute Toxicity - Inhalation [Category 3]
Skin Corrosion/Irritation [Category 2]
Eye Damage/Irritation [Category 2A]
Sensitization - Skin [Category 1]
Carcinogenicity [Category 2]
Specific Target Organ Toxicity (Single Exposure) [Category 2]
Specific Target Organ Toxicity (Repeated Exposure) [Category 2]
Flammable Liquids [Category 3]
Aquatic Hazard (Acute) [Category 1]
Aquatic Hazard (Long-Term) [Category 1]

Signal word: Danger!

Hazard Statement(s):
Causes serious eye irritation
Causes skin irritation
Flammable liquid and vapor
May cause an allergic skin reaction
Suspected of causing cancer
Toxic if swallowed
Toxic in contact with skin
Toxic if inhaled
Very toxic to aquatic life
Very toxic to aquatic life with long lasting effects
May cause damage to organs: Respiratory System
May cause damage to organs: Digestive Tract through prolonged or repeated exposure.

Pictogram(s) or Symbol(s):

Precautionary Statement(s):

2. HAZARD(S) IDENTIFICATION

[Prevention] Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Wear protective gloves and protective clothing. Do not breathe fume, mist, vapors or spray. Use only outdoors or in a well-ventilated area. Wear protective gloves. Wear eye and face protection. Avoid breathing dusts or mists. Contaminated work clothing must not be allowed out of the workplace. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves, protective clothing, eye protection and face protection. Wash all exposed skin thoroughly after handling. Keep away from heat, sparks, open flames or other hot surfaces. - No smoking. Keep container tightly closed. Ground or bond container and receiving equipment. Use explosion-proof electrical, ventilating, lighting, and equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wear protective gloves, eye protection and face protection.

[Response] If swallowed: Immediately call a poison center or doctor. Rinse mouth. If on skin: Wash with plenty of water. Call a poison center or doctor if you feel unwell. Take off immediately all contaminated clothing and wash it before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a poison center or doctor. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse. If exposed or concerned: Get medical advice or attention. If exposed or concerned: Call a poison center or doctor. Get medical advice or attention if you feel unwell. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. In case of fire: Use dry chemical, CO2, water spray or alcohol-resistant foam to extinguish.

[Storage] Store locked up. Store in a well-ventilated place. Keep container tightly closed. Store in a well-ventilated place. Keep cool.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance
Components: cis-1,3-Dichloropropene
Percent: >98.0%(GC)
CAS Number: 10061-01-5
Molecular Weight: 110.97
Chemical Formula: $C_3H_4Cl_2$
Synonyms: cis-3-Chloroallyl Chloride

4. FIRST-AID MEASURES

Inhalation: May cause coughing, difficult breathing and nausea. Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed. Inhalation of vapors or contact with substance will result in contamination and potential harmful effects. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact: Immediately call a poison center or doctor. Effects of exposure (skin contact) to substance may be delayed. Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Eye contact: IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Contact with material may irritate or burn eyes. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Toxic if swallowed. Do not induce vomiting with out medical advice. Effects of exposure (ingestion) to substance may be delayed. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: Redness.
Delayed: May cause skin sensitization. Possibly carcinogenic to humans.

4. FIRST-AID MEASURES

Immediate medical attention: WARNING: It might be dangerous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is toxic. CAUTION: Victim may be a source of contamination. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO_2 or water spray. Consult with local fire authorities before attempting large scale fire fighting operations.

Specific hazards arising from the chemical

Hazardous combustion products: These products include: Carbon oxides Halogenated compounds

Other specific hazards: WARNING: Highly toxic HCl gas is produced during combustion.

Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient. Do not use straight streams. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Move containers from fire area if you can do it without risk.

Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Use spark-proof tools and explosion-proof equipment. Remove all sources of ignition. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Wear protective clothing (chemical resistant suit and chemical resistant boots). Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

Emergency procedures: Isolate area until gas has dispersed. Do not clean-up or dispose except under supervision of a specialist. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). All equipment used when handling the product must be grounded. Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material.

Environmental precautions:

Keep away from living quarters. Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Do NOT breath gas, fumes, vapor, or spray. Manipulate under an adequate fume hood. Do not ingest. Avoid contact with skin and eyes. Avoid contact with skin. Avoid exposure - obtain special instructions before use. Avoid prolonged or repeated exposure. Normal measures for preventive fire protection. Keep away from heat and sources of ignition. Use explosion-proof equipment. Use only non-sparking hand tool when handling this product. Ground all equipment containing material. Take measures to prevent build up of electrostatic charge. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Store locked up. Keep containers tightly closed in a cool, well-ventilated place. Keep away from sources of ignition. Store and use away from heat, sparks, open flame, or any other ignition source. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods. Store under inert gas (e.g. Argon).

Storage incompatibilities: Combustible substances, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Appropriate engineering controls:
Handle only in a fully enclosed system and equipment. Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection:	Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection:	Wear protective gloves.
Eye protection:	Splash goggles.
Skin and body protection:	Wear protective clothing (chemical resistant suit and chemical resistant boots).

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C):	Liquid
Form:	Clear
Color:	Colorless - Slightly pale yellow
Odor:	No data available
Odor threshold:	No data available

Melting point/freezing point:	No data available	**pH:**	No data available
Boiling point/range:	104°C (219°F)	**Vapor pressure:**	5.7kPa/25°C
Decomposition temperature:	No data available	**Vapor density:**	3.8
Relative density:	1.23	**Dynamic Viscosity:**	No data available
Kinematic Viscosity:	No data available		
Partition coefficient: n-octanol/water (log P_{ow})	No data available	**Evaporation rate:** (Butyl Acetate = 1)	No data available
Flash point:	27°C (81°F)	**Autoignition temperature:**	392°C (738°F)
Flammability (solid, gas):	No data available	**Flammability or explosive limits:**	
		Lower:	5.3%
		Upper:	14.5%

Solubility(ies):
Water: Very slightly soluble
Soluble: Ether, Benzene, Chloroform

10. STABILITY AND REACTIVITY

Reactivity:	Not Available.
Chemical Stability:	Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions:	In use, may form flammable/explosive vapor-air mixture.
Conditions to avoid:	Avoid excessive heat and light.
Incompatible materials:	Oxidizing agents
Hazardous Decomposition Products:	No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: UC8325000

Acute Toxicity:
No data available

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
dns-hmn-hla 100 umol/L

mmo-sat 20 ug/plate (+/-S9)

Carcinogenicity:

scu-mus TDLo:9240 mg/kg/77W-I

IARC:	Group 2B (Possibly carcinogenic to humans) .	**NTP:**	b (Reasonably anticipated to be carcinogens).	**OSHA:**	No data available

Reproductive toxicity:
No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.
Symptoms related to exposure:
Overexposure may result in serious illness or death. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Skin contact may result in redness, pain or dry skin. Eye contact may result in redness or pain. Skin contact may result in sensitization. Readily absorbed through skin.
Potential Health Effects:
Skin and eye contact may result in irritation.
Target organ(s):
May cause damage to organs: Respiratory System
May cause damage to organs: Digestive Tract through prolonged or repeated exposure.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Fish:	No data available
Crustacea:	No data available
Algae:	No data available

Persistence and degradability:	No data available
Bioaccumulative potential (BCF):	<2.5 (conc. 34.6 ug/L), <26 (conc. 26 ug/L)
Mobillity in soil:	No data available
Partition coefficient: n-octanol/water (log P_{ow})	No data available
Soil adsorption (Koc):	No data available
Henry's Law: constant (PaM^3/mol)	No data available

13. DISPOSAL CONSIDERATIONS

Disposal of product:	Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.
Disposal of container:	Dispose of as unused product. Do not re-use empty containers.
Other considerations:	Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2047	Dichloropropenes	3 Flammable liquid	III

IATA

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2047	Dichloropentanes	3 Flammable liquid	III

IMDG

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2047	Dichloropropenes	3 Flammable liquid	III

EmS number:	F-E, S-D
Reportable Quantitiy:	100 Pounds (45.4 Kilograms)

15. REGULATORY INFORMATION

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):
This product is NOT on the EPA Toxic Substances Control Act (TSCA) inventory. The following notices are required by 40 CFR 720.36 (C) for those products not on the inventory list:
(i) These products are supplied solely for use in research and development by or under the supervision of a technically qualified individual as defined in 40 CFR 720.0 et sec.
(ii) The health risks of these products have not been fully determined. Any information that is or becomes available will be supplied on a SDS sheet.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313:	Not Listed
SARA 302:	Not Listed

State Regulations

State Right-to-Know

Massachusetts	Not Listed
New Jersey	Not Listed
Pennsylvania	Not Listed
California Proposition 65:	Not Listed

Other Information

NFPA Rating:

Health:	2
Flammability:	3
Instability:	0

HMIS Classification:

Health:	2
Flammability:	3
Physical:	0

International Inventories

WHMIS hazard class:	B2: Flammable Liquid. D1B: Materials causing immediate and serious toxic effects. (Toxic) D2B: Materials causing other toxic effects. (Toxic)
EC-No:	233-195-8

16. OTHER INFORMATION

Revision date: 11/10/2015
Revision number: 3
TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

CYCLOHEXANE **ICSC: 0242 (June 2011)**

Hexahydrobenzene
Hexamethylene
Hexanaphthene

CAS #: 110-82-7
UN #: 1145
EC Number: 203-806-2

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive. Heating will cause rise in pressure with risk of bursting.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools. Prevent build-up of electrostatic charges (e.g., by grounding).	Use water spray, foam, powder, carbon dioxide. Water may be ineffective. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Nausea. Headache. Dizziness. Weakness. Drowsiness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety goggles or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Abdominal pain. Nausea. Vomiting. Aspiration hazard! Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Evacuate danger area! Consult an expert! Remove all ignition sources. Personal protection: self-contained breathing apparatus. Ventilation. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.

STORAGE

Fireproof. Provision to contain effluent from fire extinguishing. Separated from strong oxidants. Store in an area without drain or sewer access.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Highly flammable liquid and vapour
Causes eye irritation
Causes mild skin irritation
May cause drowsiness and dizziness
May be fatal if swallowed and enters airways
Very toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

CYCLOHEXANE **ICSC: 0242**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
Heating may cause violent combustion or explosion. Reacts with strong oxidants.

Formula: C_6H_{12}
Molecular mass: 84.2
Boiling point: 81°C
Melting point: 7°C
Relative density (water = 1): 0.8
Solubility in water, g/100ml at 25°C: 0.0058 (very poor)
Vapour pressure, kPa at 20°C: 10.3
Relative vapour density (air = 1): 2.9
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2
Flash point: -18°C c.c.
Auto-ignition temperature: 260°C
Explosive limits, vol% in air: 1.3-8.4
Octanol/water partition coefficient as log Pow: 3.4
Viscosity: 1.26x10-6 mm²/s at 26°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Effects of short-term exposure
The substance is mildly irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure could cause lowering of consciousness.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dryness and cracking and dermatitis.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 100 ppm as TWA.
MAK: 700 mg/m^3, 200 ppm; peak limitation category: II(4); pregnancy risk group: D.
EU-OEL: 700 mg/m^3, 200 ppm as TWA

ENVIRONMENT

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES

The odour warning when the exposure limit value is exceeded is insufficient.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, Xn, N; R: 11-38-65-67-50/53; S: (2)-9-16-25-33-60-61-62; Note: 4

SAFETY DATA SHEET

Revision Date 14-Feb-2020 **Revision Number** 2

1. Identification

Product Name **Dibromochloromethane**

Cat No. : **A16938**

CAS-No 124-48-1
Synonyms CDBM; Dibromochloromethane

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com

Emergency Telephone Number
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660.
After normal business hours, call Carechem 24 at (866) 928-0789.

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity	Category 4
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Warning

Hazard Statements
Harmful if swallowed
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Wear protective gloves/protective clothing/eye protection/face protection
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Skin
IF ON SKIN: Wash with plenty of soap and water
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
Storage
Store in a well-ventilated place. Keep container tightly closed
Store locked up
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Chlorodibromomethane	124-48-1	> 98

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention.

Inhalation Remove from exposure, lie down. Remove to fresh air. If not breathing, give artificial respiration. Get medical attention.

Ingestion Call a physician immediately. Clean mouth with water.

Most important symptoms and effects Difficulty in breathing. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Water spray. Carbon dioxide (CO_2). Dry chemical. Chemical foam.

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature No information available
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
Carbon monoxide (CO). Carbon dioxide (CO_2). Hydrogen halides. Bromine. Hydrogen chloride gas.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	0	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment as required.
Environmental Precautions See Section 12 for additional Ecological Information.

Methods for Containment and Clean Up Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal. Do not flush into surface water or sanitary sewer system.

7. Handling and storage

Handling Avoid contact with skin and eyes. Do not breathe mist/vapors/spray. Handle product only in closed system or provide appropriate exhaust ventilation.

Storage Keep in a dry place. Keep container tightly closed. Keep refrigerated.

8. Exposure controls / personal protection

Exposure Guidelines This product does not contain any hazardous materials with occupational exposure limitsestablished by the region specific regulatory bodies.

Engineering Measures Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by

OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection No protective equipment is needed under normal use conditions.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Yellow-orange
Odor	sweet
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-22 °C / -7.6 °F
Boiling Point/Range	115 - 120 °C / 239 - 248 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	7.2
Specific Gravity	2.451
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C H Br2 Cl
Molecular Weight	208.28

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products.

Incompatible Materials Strong oxidizing agents, Strong acids, Strong bases, Strong reducing agents, Metals

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2), Hydrogen halides, Bromine, Hydrogen chloride gas

Hazardous Polymerization No information available.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Chlorodibromomethane	LD50 = 370 mg/kg (Rat)	Not listed	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Chlorodibromomethane	124-48-1	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects Substances which cause concern for man owing to possible mutagenic effects but for which the available information is not adequate for making a satisfactory assessment

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Do not empty into drains.

Persistence and Degradability Persistence is unlikely

Bioaccumulation/ Accumulation No information available.

Mobility . Will likely be mobile in the environment due to its water solubility.

Component	log Pow
Chlorodibromomethane	2.09

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN2810
Hazard Class 6.1
Packing Group III

TDG

UN-No	UN2810
Hazard Class	6.1
Packing Group	III
IATA	Not regulated
IMDG/IMO	Not regulated

15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Chlorodibromomethane	124-48-1	X	ACTIVE	-

Legend:
TSCA - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Chlorodibromomethane	124-48-1	-	X	204-704-0	-	-	-	-	-

U.S. Federal Regulations

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Chlorodibromomethane	-	-	X	X

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Chlorodibromomethane	100 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Chlorodibromomethane	X	X	X	-	-

U.S. Department of Transportation

Reportable Quantity (RQ):	N
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security	This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade	No information available

16. Other information

Prepared By	Health, Safety and Environmental Department Email: tech@alfa.com www.alfa.com
Revision Date	14-Feb-2020
Print Date	14-Feb-2020
Revision Summary	SDS authoring systems update, replaces ChemGes SDS No. 124-48-1/2.

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

DICHLORODIFLUOROMETHANE **ICSC: 0048 (July 2002)**

Difluorodichloromethane
R 12
CFC 12

CAS #: 75-71-8
UN #: 1028
EC Number: 200-893-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep cylinder cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Irregular heartbeat. Confusion. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Ventilation.	**According to UN GHS Criteria**
STORAGE	
Separated from incompatible materials. See Chemical Dangers. Cool. Ventilation along the floor.	**Transportation** **UN Classification** UN Hazard Class: 2.2
PACKAGING	
Special insulated cylinder.	

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

DICHLORODIFLUOROMETHANE **ICSC: 0048**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS COMPRESSED LIQUEFIED GAS WITH CHARACTERISTIC ODOUR.

Physical dangers
The gas is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

Chemical dangers
Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive gases of hydrogen chloride (see ICSC 0163), phosgene (see ICSC 0007), hydrogen fluoride (see ICSC 0283) and carbonyl fluoride (see ICSC 0633). Reacts violently with metals such as zinc and powdered aluminium. Attacks magnesium and its alloys.

Formula: CCl_2F_2
Molecular mass: 120.9
Boiling point: -30°C
Melting point: -158°C
Relative density (water = 1): 1.5
Solubility in water, g/100ml at 20°C: 0.03
Vapour pressure, kPa at 20°C: 568
Relative vapour density (air = 1): 4.2
Octanol/water partition coefficient as log Pow: 2.16

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation.

Effects of short-term exposure
Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the cardiovascular system and central nervous system. This may result in cardiac disorders and central nervous system depression. Exposure could cause lowering of consciousness. See Notes.

Inhalation risk
On loss of containment this substance can cause suffocation by lowering the oxygen content of the air in confined areas.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1000 ppm as TWA; A4 (not classifiable as a human carcinogen).
MAK: 5000 mg/m^3, 1000 ppm; peak limitation category: II(2); pregnancy risk group: C

ENVIRONMENT

Avoid release to the environment because of its impact on the ozone layer.

NOTES

High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death.
Check oxygen content before entering area.
The odour warning when the exposure limit value is exceeded is insufficient.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.
Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

ADDITIONAL INFORMATION

EC Classification

ETHANOL (ANHYDROUS) **ICSC: 0044 (May 2018)**

Ethyl alcohol
Absolute ethanol
Methyl carbinol
Grain alcohol

CAS #: 64-17-5
UN #: 1170
EC Number: 200-578-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive. Risk of fire and explosion on contact with incompatible substances. See Chemical Dangers.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. NO contact with incompatible materials: See Chemical Dangers	Use water spray, powder, alcohol-resistant foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Headache. Fatigue. Drowsiness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest.
Skin	Dry skin.	Protective clothing. Apron. Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain. Burning sensation.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Headache. Confusion. Dizziness. Unconsciousness.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Remove all ignition sources. Ventilation. Do NOT wash away into sewer. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in inert absorbent. Wash away remainder with plenty of water. Store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from : see Chemical Dangers.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Highly flammable liquid and vapour
Harmful if swallowed
Causes serious eye irritation
May cause damage to organs through prolonged or repeated exposure

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

ETHANOL (ANHYDROUS) **ICSC: 0044**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour mixes well with air, explosive mixtures are easily formed.

Chemical dangers
Reacts slowly with calcium hypochlorite, silver oxide and ammonia. This generates fire and explosion hazard. Reacts violently with strong oxidants such as nitric acid, silver nitrate, mercuric nitrate and magnesium perchlorate. This generates fire and explosion hazard.

Formula: CH_3CH_2OH / C_2H_6O
Molecular mass: 46.1
Boiling point: 78°C
Melting point: -114 °C
Relative density (water = 1): 0.79
Solubility in water: miscible
Vapour pressure, kPa at 20°C: 5.8
Relative vapour density (air = 1): 1.6
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.03
Flash point: 12.0 °C c.c.
Auto-ignition temperature: 400°C
Explosive limits, vol% in air: 3.1-27.7
Octanol/water partition coefficient as log Pow: -0.32
Viscosity: 1.074 mPa*s at 20°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Effects of short-term exposure
The substance is severely irritating to the eyes. The vapour at high levels is irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the upper respiratory tract and central nervous system. This may result in irritation, headache, fatigue and lack of concentration. See Notes.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1000 ppm as STEL; A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: 380 mg/m^3, 200 ppm; peak limitation category: II(4); carcinogen category: 5; pregnancy risk group: C; germ cell mutagen group: 5

ENVIRONMENT

Environmental effects of the substance have been adequately investigated, but no significant effects have been found.

NOTES

Ethanol consumption during pregnancy may adversely affect the unborn child.
Chronic ingestion of ethanol may cause liver cirrhosis and cancer.

ADDITIONAL INFORMATION

EC Classification

ETHYL ACETATE **ICSC: 0367 (April 2014)**

Acetic acid, ethyl ester
Acetic ether

CAS #: 141-78-6
UN #: 1173
EC Number: 205-500-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive. Heating will cause rise in pressure with risk of bursting.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non-sparking handtools. Do NOT use compressed air for filling, discharging, or handling.	Use alcohol-resistant foam, foam, powder, carbon dioxide, fine water spray. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Cough. Headache. Drowsiness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Dry skin.	Protective gloves.	Rinse contaminated clothes (fire hazard) with plenty of water. Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness.	Wear safety spectacles or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible).
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Seek medical attention if you feel unwell.

SPILLAGE DISPOSAL

Remove all ignition sources. Evacuate danger area! Consult an expert! Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT wash away into sewer. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from strong oxidants, strong bases and strong acids.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Highly flammable liquid and vapour
May cause drowsiness or dizziness

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

ETHYL ACETATE **ICSC: 0367**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers
Reacts with strong oxidants. This generates fire and explosion hazard. Reacts violently with strong bases and strong acids. Attacks rubber and some forms of plastic.

Formula: $C_4H_8O_2$ / $CH_3COOC_2H_5$
Molecular mass: 88.1
Boiling point: 77°C
Melting point: -84°C
Relative density (water = 1): 0.9
Solubility in water, g/100ml at 20°C: 8.7 (poor)
Vapour pressure, kPa at 20°C: 10
Relative vapour density (air = 1): 3.0
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2
Flash point: -4°C c.c.
Auto-ignition temperature: 427°C
Explosive limits, vol% in air: 2.0-12.8
Octanol/water partition coefficient as log Pow: 0.73

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour.

Effects of short-term exposure
The substance is mildly irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause lowering of consciousness.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 400 ppm as TWA.
MAK: 750 mg/m^3, 200 ppm; peak limitation category: I(2); pregnancy risk group: C.
EU-OEL: 734 mg/m^3, 200 ppm as TWA; 1468 mg/m^3, 400 ppm as STEL

ENVIRONMENT

NOTES

Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, Xi; R: 11-36-66-67; S: (2)-16-26-33

ETHYLBENZENE **ICSC: 0268 (November 2007)**

Ethylbenzol
Phenylethane
EB

CAS #: 100-41-4
UN #: 1175
EC Number: 202-849-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	Use dry powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Dizziness. Drowsiness. Headache.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation in the throat and chest. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from strong oxidants. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Highly flammable liquid and vapour
Harmful if inhaled
May be harmful if swallowed
Causes mild skin irritation
Causes eye irritation
Suspected of causing cancer
May cause respiratory irritation
May cause drowsiness and dizziness
May be harmful if swallowed and enters airways
Toxic to aquatic life

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

ETHYLBENZENE **ICSC: 0268**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH AROMATIC ODOUR.

Physical dangers
The vapour mixes well with air, explosive mixtures are easily formed.

Chemical dangers
Reacts with strong oxidants. Attacks plastics and rubber.

Formula: $C_8H_{10}/C_6H_5C_2H_5$
Molecular mass: 106.2
Boiling point: 136°C
Melting point: -95°C
Relative density (water = 1): 0.9
Solubility in water, g/100ml at 20°C: 0.015
Vapour pressure, kPa at 20°C: 0.9
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 18°C c.c.
Auto-ignition temperature: 432°C
Explosive limits, vol% in air: 1.0-6.7
Octanol/water partition coefficient as log Pow: 3.1
Viscosity: 0.6 mm²/s at 25°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure above the OEL could cause lowering of consciousness.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
This substance is possibly carcinogenic to humans. The substance may have effects on the kidneys and liver. This may result in impaired functions.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 20 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.
MAK: 88 mg/m^3, 20 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.
EU-OEL: 442 mg/m^3, 100 ppm as TWA; 884 mg/m^3, 200 ppm as STEL; (skin)

ENVIRONMENT

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

The odour warning when the exposure limit value is exceeded is insufficient.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, Xn; R: 11-20; S: (2)-16-24/25-29

n-HEPTANE **ICSC: 0657 (June 2015)**

Heptane

CAS #: 142-82-5
UN #: 1206
EC Number: 205-563-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	Use alcohol-resistant foam, dry powder, carbon dioxide, water spray. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Incoordination. Dizziness. Weakness. Nausea. Drowsiness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Swelling. Pain.	Protective gloves.	Rinse and then wash skin with water and soap. Refer for medical attention if skin irritation occurs.
Eyes	Redness.	Wear safety goggles in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Aspiration hazard! Sore throat. Abdominal pain. Headache. Dizziness. Nausea. Vomiting. Unconsciousness.	Do not eat, drink, or smoke during work.	Rinse mouth. Give nothing to drink. Do NOT induce vomiting. Refer immediately for medical attention. See Notes.

SPILLAGE DISPOSAL

Remove all ignition sources. Consult an expert! Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from strong oxidants. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Highly flammable liquid and vapour
May be fatal if swallowed and enters airways
Causes skin irritation
May cause drowsiness or dizziness
Very toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

n-HEPTANE **ICSC: 0657**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
VOLATILE COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
Reacts violently with strong oxidants. This generates fire and explosion hazard. Attacks many plastics.

Formula: C_7H_{16} / $CH_3(CH_2)_5CH_3$
Molecular mass: 100.2
Boiling point: 98.4°C
Melting point: -90.7°C
Density (at 20°C): 0.68 g/ml
Solubility in water, mg/l at 25°C: 2.2 (very poor)
Vapour pressure, kPa at 20°C: 4.6
Relative vapour density (air = 1): 3.5
Flash point: -7°C c.c.
Auto-ignition temperature: 220°C
Explosive limits, vol% in air: 0.8-6.7
Octanol/water partition coefficient as log Pow: 4.66

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Effects of short-term exposure
The substance is irritating to the skin. The vapour is irritating to the respiratory tract. If swallowed the substance easily enters the airways and could result in aspiration pneumonitis. The substance may cause effects on the central nervous system.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 400 ppm as TWA; 500 ppm as STEL.
MAK: 2100 mg/m^3, 500 ppm; peak limitation category: I(1); pregnancy risk group: D.
EU-OEL: 2085 mg/m^3, 500 ppm as TWA

ENVIRONMENT

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. Bioaccumulation of this chemical may occur in fish. It is strongly advised not to let the chemical enter into the environment.

NOTES

The odour warning when the exposure limit value is exceeded is insufficient.
The symptoms of chemical pneumonitis do not become manifest until a few hours or even days have passed.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, Xn, N; R: 11-38-50/53-65-67; S: (2)-9-16-29-33-60-61-62; Note: C

HEXACHLOROBUTADIENE **ICSC: 0896 (August 1997)**

1,1,2,3,4,4-Hexachloro-1,3-butadiene
Perchlorobutadiene

CAS #: 87-68-3
UN #: 2279
EC Number: 201-765-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Burning sensation. Cough. Sore throat. Symptoms may be delayed. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Pain. Redness. Blisters. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Pain. Redness. Severe deep burns. Loss of vision.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from food and feedstuffs. Well closed. Ventilation along the floor. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

Do not transport with food and feedstuffs.
Severe marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

HEXACHLOROBUTADIENE **ICSC: 0896**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes on burning. This produces toxic and corrosive fumes including hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Attacks rubber and some forms of plastic.

Formula: C_4Cl_6 / CCl_2=CClCCl=CCl_2
Molecular mass: 260.8
Boiling point: 212°C
Melting point: -18°C
Relative density (water = 1): 1.68
Solubility in water: none
Vapour pressure, Pa at 20°C: 20
Relative vapour density (air = 1): 9.0
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00
Flash point: 90°C
Auto-ignition temperature: 610°C
Octanol/water partition coefficient as log Pow: 4.90

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. The liquid is corrosive. The substance may cause effects on the kidneys.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact may cause skin sensitization. May cause genetic damage in humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.02 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: 0.22 mg/m^3, 0.02 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. The substance may cause long-term effects in the aquatic environment.

NOTES

ADDITIONAL INFORMATION

EC Classification

n-HEXANE **ICSC: 0279 (April 2000)**
Hexyl hydride

CAS #: 110-54-3
UN #: 1208
EC Number: 203-777-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Drowsiness. Lethargy. Headache. Nausea. Weakness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness. Pain.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Rest. Refer for medical attention .

SPILLAGE DISPOSAL

Consult an expert! Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Remove all ignition sources. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from strong oxidants. Well closed.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

n-HEXANE **ICSC: 0279**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
VOLATILE COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers
Reacts with strong oxidants. This generates fire and explosion hazard. Attacks some plastics, rubber and coatings.

Formula: C_6H_{14}
Molecular mass: 86.2
Boiling point: 69°C
Melting point: -95°C
Relative density (water = 1): 0.7
Solubility in water, g/100ml at 20°C: 0.0013
Vapour pressure, kPa at 20°C: 17
Relative vapour density (air = 1): 3.0
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.3
Flash point: -22°C c.c.
Auto-ignition temperature: 225°C
Explosive limits, vol% in air: 1.1-7.5
Octanol/water partition coefficient as log Pow: 3.9

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Effects of short-term exposure
The substance is irritating to the skin. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure at high levels could cause lowering of consciousness.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the central nervous system and peripheral nervous system. This may result in polyneuropathy. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 50 ppm as TWA; (skin); BEI issued.
MAK: 180 mg/m^3, 50 ppm; peak limitation category: II(8); pregnancy risk group: C.
EU-OEL: 72 mg/m^3, 20 ppm as TWA

ENVIRONMENT

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, Xn, N; R: 11-38-48/20-62-65-67-51/53; S: (2)-9-16-29-33-36/37-61-62

ISOPROPYL ALCOHOL **ICSC: 0554 (July 2020)**

1-methylethanol
2-hydroxypropane
2-Propanol
Propan-2-ol
Isopropanol
Dimethylcarbinol

CAS #: 67-63-0
UN #: 1219
EC Number: 200-661-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive. Risk of explosion on contact with strong oxidants.	NO open flames, NO sparks and NO smoking. NO contact with strong oxidizing agents. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	Use water, powder, alcohol-resistant foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Cough. Headache. Dizziness. Drowsiness. Further see Ingestion.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin.	Protective gloves.	First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again. See Notes.
Eyes	Redness. Pain. Blurred vision. Burns.	Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation. Abdominal pain. Nausea. Vomiting. Ataxia. Convulsions. Laboured breathing. Low blood pressure. Cardiac dysrhythmia. Unconsciousness.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give nothing to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Evacuate danger area! Consult an expert! Remove all ignition sources. Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable non-plastic containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Wash away remainder with plenty of water.

STORAGE

Fireproof. Separated from strong oxidants. Cool. Well closed.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Highly flammable liquid and vapour
Causes serious eye irritation
May cause drowsiness or dizziness

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

ISOPROPYL ALCOHOL **ICSC: 0554**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID.

Physical dangers
The vapour mixes well with air, explosive mixtures are easily formed.

Chemical dangers
Reacts with strong oxidants. This generates explosion hazard. Decomposes on heating. This produces irritating fumes and flammable and toxic gas. Attacks some plastics and rubber.

Formula: C_3H_8O / $CH_3CHOHCH_3$
Molecular mass: 60.1
Boiling point: 83°C
Melting point: -90°C
Relative density (water = 1): 0.79
Solubility in water: miscible
Vapour pressure, kPa at 20°C: 4.4
Relative vapour density (air = 1): 2.1
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.05
Flash point: 11.7°C c.c.
Auto-ignition temperature: 456°C
Explosive limits, vol% in air: 2-12
Octanol/water partition coefficient as log Pow: 0.05

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour.

Effects of short-term exposure
The substance is irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause unconsciousness.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dryness and cracking.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 200 ppm as TWA; 400 ppm as STEL; A4 (not classifiable as a human carcinogen); BEI issued.
MAK: 500 mg/m^3, 200 ppm; peak limitation category: II(2); pregnancy risk group: C

ENVIRONMENT

Environmental effects of the substance have been adequately investigated, but no significant effects have been found.

NOTES

When large surface areas of skin and clothes are exposed to the pure substance the fire hazard is the main concern, for which rinsing first and then removing clothes is advised.

ADDITIONAL INFORMATION

EC Classification

CUMENE **ICSC: 0170 (April 2014)**

(1-Methylethyl)benzene
2-Phenylpropane
Isopropylbenzene

CAS #: 98-82-8
UN #: 1918
EC Number: 202-704-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 31°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 31°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Incoordination. Drowsiness. Headache.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	See Inhalation. Aspiration hazard!	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Personal protection: chemical protection suit and filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.

STORAGE

Fireproof. Separated from strong oxidants and acids. Cool. Keep in the dark. Store only if stabilized. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Flammable liquid and vapour
Harmful if swallowed
Suspected of causing cancer
May be fatal if swallowed and enters airways
Very toxic to aquatic life

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

CUMENE **ICSC: 0170**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
Reacts violently with acids and strong oxidants. This generates fire and explosion hazard. The substance can form explosive peroxides.

Formula: C_9H_{12} / $C_6H_5CH(CH_3)_2$
Molecular mass: 120.2
Boiling point: 152°C
Melting point: -96°C
Relative density (water = 1): 0.90
Solubility in water, g/l at 20°C: 0.2 (very poor)
Vapour pressure, Pa at 20°C: 427
Relative vapour density (air = 1): 4.2
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01
Flash point: 31°C c.c.
Auto-ignition temperature: 420°C
Explosive limits, vol% in air: 0.9-6.5
Octanol/water partition coefficient as log Pow: 3.66
Viscosity: 0.85 mm²/s at 25°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
If swallowed the substance easily enters the airways and could result in aspiration pneumonitis. The substance may cause effects on the central nervous system. Exposure far above the OEL could cause unconsciousness.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and upper respiratory tract. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: 50 mg/m^3, 10 ppm; peak limitation category: II(4); skin absorption (H); carcinogen category: 3; pregnancy risk group: C.
EU-OEL: 50 mg/m^3, 10 ppm as TWA; 250 mg/m^3, 50 ppm as STEL; (skin)

ENVIRONMENT

The substance is very toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

Check for peroxides prior to distillation; eliminate if found.
Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 10-37-51/53-65; S: (2)-24-37-61-62; Note: C

METHYL BROMIDE **ICSC: 0109 (November 2009)**

Bromomethane
Monobromomethane

CAS #: 74-83-9
UN #: 1062
EC Number: 200-813-2

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with aluminium, zinc, magnesium or oxygen.	NO open flames. NO contact with aluminium, zinc, magnesium or pure oxygen.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with appropriate extinguishing agent. In case of fire: keep cylinder cool by spraying with water.

STRICT HYGIENE! IN ALL CASES CONSULT A DOCTOR! FIRST AID: USE PERSONAL PROTECTION.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Dizziness. Headache. Abdominal pain. Vomiting. Weakness. Shortness of breath. Confusion. Hallucinations. Loss of speech. Incoordination. Convulsions. Symptoms may be delayed. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Tingling sensation. Itching. Burning sensation. Redness. Blisters. Pain. ON CONTACT WITH LIQUID: FROSTBITE. Further see Inhalation.	Cold-insulating gloves. Protective clothing.	Rinse skin with plenty of water or shower. ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer immediately for medical attention.
Eyes	Redness. Pain. Blurred vision. Temporary loss of vision.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion			

SPILLAGE DISPOSAL

Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Ventilation. NEVER direct water jet on liquid.

STORAGE

Fireproof if in building. Separated from strong oxidants, aluminium and cylinders containing oxygen. Cool. Ventilation along the floor.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Contains gas under pressure; may explode if heated
Toxic if inhaled
Causes skin and eye irritation
Causes damage to lungs, kidneys and central nervous system if inhaled
Causes damage to the liver, the kidneys and the central nervous system through prolonged or repeated exposure if inhaled
Harms public health and the environment by destroying ozone in the upper atmosphere

Transportation
UN Classification
UN Hazard Class: 2.3

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission


International
Labour
Organization
World Health
Organization

METHYL BROMIDE **ICSC: 0109**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
ODOURLESS COLOURLESS COMPRESSED LIQUEFIED GAS.

Physical dangers
The gas is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

Chemical dangers
Decomposes on heating. This produces toxic and corrosive fumes including hydrogen bromide, bromine and carbon oxybromide. Reacts with strong oxidants. Attacks many metals in the presence of water. Attacks aluminium, zinc and magnesium. This produces pyrophoric compounds. This generates fire and explosion hazard.

Formula: CH_3Br
Molecular mass: 94.9
Boiling point: 4°C
Melting point: -94°C
Relative density (water = 1): 1.7 (liquid, 0°C)
Solubility in water, g/100ml at 20°C: 1.5
Vapour pressure, kPa at 20°C: 1893
Relative vapour density (air = 1): 3.3
Flash point: 194°C
Auto-ignition temperature: 537°C
Explosive limits, vol% in air: 10-16
Octanol/water partition coefficient as log Pow: 1.19

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and through the skin also as a vapour.

Effects of short-term exposure
The substance, as a liquid, is severely irritating to the skin. The substance, as a liquid, is irritating to the eyes and respiratory tract. Inhalation may cause lung oedema. See Notes. Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the central nervous system and kidneys. The effects may be delayed up to 48 hours. Exposure at high levels could cause death. Medical observation is indicated.

Inhalation risk
A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

Effects of long-term or repeated exposure
The substance may have effects on the nervous system, kidneys and liver. This may result in impaired functions. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1 ppm as TWA; (skin); A4 (not classifiable as a human carcinogen).
MAK: peak limitation category: I(2); carcinogen category: 3; pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms. Avoid release to the environment because of its impact on the ozone layer. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.
Toxic effects on the nervous system may be delayed for several hours.
Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered.
Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 23/25-36/37/38-48/20-68-50-59; S: (1/2)-15-27-36/39-38-45-59-61

METHYL ETHYL KETONE **ICSC: 0179 (April 2017)**

Ethyl methyl ketone
2-Butanone
MEK
Methyl acetone

CAS #: 78-93-3
UN #: 1193
EC Number: 201-159-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	Use alcohol-resistant foam, water, powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Headache. Dizziness. Nausea. Vomiting. Drowsiness. Numbness. Laboured breathing.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation. Unconsciousness.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give nothing to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: self-contained breathing apparatus. Do NOT wash away into sewer. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from strong oxidants and strong acids. Cool. Well closed. Store in an area without drain or sewer access.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Highly flammable liquid and vapour
Causes serious eye irritation
May cause respiratory irritation
May cause drowsiness or dizziness
Suspected of damaging fertility or the unborn child
May be harmful if swallowed and enters airways

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

METHYL ETHYL KETONE **ICSC: 0179**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers
Reacts violently with strong oxidants and inorganic acids. This generates fire and explosion hazard. Attacks some plastics.

Formula: C_4H_8O / $CH_3COCH_2CH_3$
Molecular mass: 72.1
Boiling point: 80°C
Melting point: -86°C
Relative density (water = 1): 0.8
Solubility in water, g/100ml at 20°C: 29 (good)
Vapour pressure, kPa at 20°C: 10.5
Relative vapour density (air = 1): 2.41
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.1
Flash point: -9°C c.c.
Auto-ignition temperature: 505°C
Explosive limits, vol% in air: 1.8-11.5
Octanol/water partition coefficient as log Pow: 0.29
Viscosity: 0.40 cP at 25°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, by ingestion and through the skin.

Effects of short-term exposure
The substance is irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system. Exposure could cause unconsciousness. If swallowed the substance easily enters the airways and could result in aspiration pneumonitis.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 200 ppm as TWA; 300 ppm as STEL; BEI issued.
MAK: 600 mg/m^3, 200 ppm; peak limitation category: I(1); skin absorption (H); pregnancy risk group: C.
EU-OEL: 600 mg/m^3, 200 ppm as TWA; 900 mg/m^3, 300 ppm as STEL

ENVIRONMENT

Avoid release to the environment in circumstances different to normal use.

NOTES

The odour warning when the exposure limit value is exceeded is insufficient.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, Xi; R: 11-36-66-67; S: (2)-9-16; Note: 6

METHYL TERT-BUTYL ETHER **ICSC: 1164 (November 2000)**

tert-Butyl methyl ether
MTBE
Methyl-1,1-dimethylethyl ether
2-Methoxy-2-methyl propane

CAS #: 1634-04-4
UN #: 2398
EC Number: 216-653-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. NO contact with oxidizing agents. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Drowsiness. Dizziness. Headache. Weakness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Nausea. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.

STORAGE

Fireproof. Separated from strong oxidants and strong acids.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

METHYL TERT-BUTYL ETHER **ICSC: 1164**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers
Reacts violently with strong oxidants. This generates fire hazard. Decomposes on contact with acids.

Formula: $(CH_3)_3COCH_3$ / $C_5H_{12}O$
Molecular mass: 88.2
Boiling point: 55°C
Melting point: -109°C
Relative density (water = 1): 0.7
Solubility in water, g/100ml at 20°C: 4.2
Vapour pressure, kPa at 20°C: 27
Relative vapour density (air = 1): 3.0
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.5
Flash point: -28°C c.c.
Auto-ignition temperature: 375°C
Explosive limits, vol% in air: 1.6-15.1
Octanol/water partition coefficient as log Pow: 1.06

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure
The substance is irritating to the skin. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure far above the OEL could cause lowering of consciousness.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

TLV: 50 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: 180 mg/m^3, 50 ppm; carcinogen category: 3; pregnancy risk group: C.
EU-OEL: 183.5 mg/m^3, 50 ppm as TWA; 367 mg/m^3, 100 ppm as STEL

ENVIRONMENT

It is strongly advised not to let the chemical enter into the environment because it is persistent.

NOTES

Much less likely to form peroxides than other ethers.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, Xi; R: 11-38; S: (2)-9-16-24

DICHLOROMETHANE **ICSC: 0058 (April 2017)**

Methylene chloride
DCM

CAS #: 75-09-2
UN #: 1593
EC Number: 200-838-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable under specific conditions. See Notes. Gives off irritating or toxic fumes (or gases) in a fire. Explosive under specific conditions. See Notes. Heating will cause rise in pressure with risk of bursting. Risk of fire and explosion.	NO contact with incompatible substances. See Chemical Dangers. See Notes.	In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Dizziness. Drowsiness. Headache. Nausea. Weakness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Administration of oxygen may be needed. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Dry skin. Redness. Burning sensation.	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Pain. Redness.	Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Administration of oxygen may be needed. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Evacuate danger area! Consult an expert! Personal protection: self-contained breathing apparatus. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from food and feedstuffs and incompatible materials. See Chemical Dangers. Well closed. Cool. Ventilation along the floor.

PACKAGING

Do not transport with food and feedstuffs.
Unbreakable packaging.
Put breakable packaging into closed unbreakable container.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Harmful if swallowed
Fatal if inhaled
Causes skin and eye irritation
May cause drowsiness or dizziness
Causes damage to central nervous system, blood, liver, the heart and lungs
May be harmful if swallowed and enters airways
Causes damage to the central nervous system through prolonged or repeated exposure if inhaled
May cause cancer

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.


International Labour Organization
World Health Organization


European Commission

DICHLOROMETHANE **ICSC: 0058**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
VERY VOLATILE COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
Decomposes on heating or on burning and on contact with hot surfaces. This produces toxic and corrosive fumes including hydrogen chloride (see ICSC 0163), phosgene (see ICSC 0007) and carbon monoxide (see ICSC 0023). Reacts violently with strong oxidants, strong bases and metals such as aluminium powder and magnesium powder. This generates fire and explosion hazard. Attacks some forms of plastic, rubber and coatings.

Formula: CH_2Cl_2
Molecular mass: 84.9
Boiling point: 40°C
Melting point: -97°C
Relative density (water = 1): 1.3 (20°C)
Solubility in water, g/100ml at 20°C: 1.3 (moderate)
Vapour pressure, kPa at 20°C: 47.4
Relative vapour density (air = 1): 2.9
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.9
Auto-ignition temperature: 605°C
Explosive limits, vol% in air: 13-22
See Notes.
Octanol/water partition coefficient as log Pow: 1.25
Viscosity: 0.32 mm²/s at 20°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, by ingestion and through the skin.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis. The substance may cause effects on the central nervous system, blood, liver, heart and lungs. Exposure could cause carbon monoxide poisoning. This may result in impaired functions. Exposure at high concentrations could cause lowering of consciousness and death. The effects may be delayed.

Inhalation risk
A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance may have effects on the central nervous system. This substance is probably carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 50 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans); (skin).
MAK: 180 mg/m^3, 50 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 5; pregnancy risk group: B.
EU-OEL: 353 mg/m^3, 100 ppm as TWA; 706 mg/m^3, 200 ppm as STEL; (skin)

ENVIRONMENT

NOTES

Do NOT use in the vicinity of a fire or a hot surface, or during welding.
The odour warning when the exposure limit value is exceeded is insufficient.
Depending on the degree of exposure, periodic medical examination is suggested.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn; R: 40; S: (2)-23-24/25-36/37

m-XYLENE **ICSC: 0085 (August 2002)**

meta-Xylene
1,3-Dimethylbenzene
m-Xylol

CAS #: 108-38-3
UN #: 1307
EC Number: 203-576-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 27°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 27°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Dizziness. Drowsiness. Headache. Nausea.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Remove all ignition sources. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from strong oxidants and strong acids.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

m-XYLENE **ICSC: 0085**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
Reacts with strong acids and strong oxidants.

Formula: $C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2
Boiling point: 139°C
Melting point: -48°C
Relative density (water = 1): 0.86
Solubility in water: none
Vapour pressure, kPa at 20°C: 0.8
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 27°C c.c.
Auto-ignition temperature: 527°C
Explosive limits, vol% in air: 1.1-7.0
Octanol/water partition coefficient as log Pow: 3.20

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes and skin. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system. Exposure to the substance may increase noise-induced hearing loss. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 100 ppm as TWA; A4 (not classifiable as a human carcinogen); BEI issued.
EU-OEL: 150 ppm as STEL; 221 mg/m^3, 50 ppm as TWA; 442 mg/m^3, 100 ppm as STEL; (skin).
MAK: 220 mg/m^3, 50 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: D

ENVIRONMENT

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
The recommendations on this Card also apply to technical xylene.
See ICSCs 0084 and 0086.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn; R: 10-20/21-38; S: (2)-25; Note: C

TCI AMERICA

SAFETY DATA SHEET

Revision number: 2
Revision date: 10/06/2014

1. IDENTIFICATION

Product name: Butylbenzene
Product code: B0713

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborgate Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

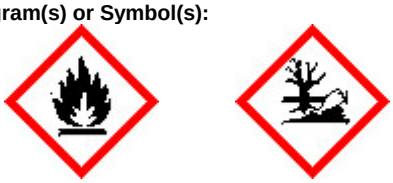
2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:
Eye Damage/Irritation [Category 2B]
Flammable Liquids [Category 3]
Aquatic Hazard (Acute) [Category 1]
Aquatic Hazard (Long-Term) [Category 1]

Signal word: Warning!

Hazard Statement(s):
Causes eye irritation
Flammable liquid and vapor
Very toxic to aquatic life
Very toxic to aquatic life with long lasting effects

Pictogram(s) or Symbol(s):



Precautionary Statement(s):

[Prevention] Wash hands and face thoroughly after handling. Keep away from heat, sparks, open flames or other hot surfaces. - No smoking. Keep container tightly closed. Ground or bond container and receiving equipment. Use explosion-proof electrical, ventilating, lighting, and equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wear protective gloves, eye protection and face protection.

[Response] If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. In case of fire: Use dry chemical, CO2, water spray or alcohol-resistant foam to extinguish.

[Storage] Store in a well-ventilated place. Keep cool.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

Hazards not otherwise classified: [HNOC] Causes mild skin irritation.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance
Components: Butylbenzene
Percent: >99.0%(GC)
CAS Number: 104-51-8
Molecular Weight: 134.22
Chemical Formula: $C_{10}H_{14}$

4. FIRST-AID MEASURES

Inhalation: Call emergency medical service. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact: Call a poison center or doctor if you feel unwell. Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Eye contact: IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Contact with material may irritate or burn eyes. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Do not induce vomiting with out medical advice. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: Redness.
Delayed: No data available

Immediate medical attention: If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO_2 , water spray, or alcohol-resistant foam. Consult with local fire authorities before attempting large scale fire fighting operations.

Specific hazards arising from the chemical
Hazardous combustion products: These products include: Carbon oxides
Other specific hazards: Closed containers may explode from heat of a fire.

Special precautions for fire-fighters:
Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient. Do not use straight streams. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Move containers from fire area if you can do it without risk.
Special protective equipment for fire-fighters:
Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Use spark-proof tools and explosion-proof equipment. Remove all sources of ignition. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures: Isolate area until gas has dispersed. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:
ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). All equipment used when handling the product must be grounded. Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material.
Environmental precautions:
Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Do NOT breath gas, fumes, vapor, or spray. Avoid contact with skin and eyes. Keep away from heat and sources of ignition. Use explosion-proof equipment. Use only non-sparking hand tool when handling this product. Ground all equipment containing material. Take measures to prevent build up of electrostatic charge. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Keep containers tightly closed in a cool, well-ventilated place. Keep away from sources of ignition. Store and use away from heat, sparks, open flame, or any other ignition source. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Combustible substances, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

Appropriate engineering controls:
Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection: Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection: Wear protective gloves.
Eye protection: Splash goggles.
Skin and body protection: Lab coat.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid
Form: Clear
Color: Colorless - Almost colorless
Odor: Characteristic
Odor threshold: No data available

Melting point/freezing point: -88°C (-126°F)
Boiling point/range: 183°C (361°F)
Decomposition temperature: No data available
Relative density: 0.86
Kinematic Viscosity: No data available

Partition coefficient: n-octanol/water (log P_{ow}) 4.38

Flash point: 59°C (138°F)
Flammability (solid, gas): No data available

pH: No data available
Vapor pressure: 0.1kPa/25°C
Vapor density: 4.6
Dynamic Viscosity: No data available

Evaporation rate: (Butyl Acetate = 1) No data available

Autoignition temperature: 410°C (770°F)
Flammability or explosive limits:
Lower: 0.8%
Upper: 5.8%

Solubility(ies):
Water: Insoluble (11.8mg/L, 25°C)
Miscible: Ether, Alcohols, Benzene

10. STABILITY AND REACTIVITY

Reactivity: Not Available.
Chemical Stability: Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions: In use, may form flammable/explosive vapor-air mixture.
Conditions to avoid: Avoid excessive heat and light.
Incompatible materials: Oxidizing agents
Hazardous Decomposition Products: No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: CY9070000

Acute Toxicity:
orl-rat LDLo:10 mL/kg

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
No data available

Carcinogenicity:

No data available

IARC: No data available **NTP:** No data available **OSHA:** No data available

Reproductive toxicity:
No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.
Symptoms related to exposure:
Eye contact may result in redness or pain. Skin contact may result in redness, pain or dry skin.
Potential Health Effects:
Skin and eye contact may result in irritation.
Target organ(s): No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity
Fish: 96h LC50:3.3 mg/L (Oryzias latipes)
Crustacea: 48h EC50:1.0 mg/L (Daphnia magna)
Algae: 72h EC50:1.1 mg/L (Selenastrum capricornutum)

Persistence and degradability: No data available
Bioaccumulative potential (BCF): 470
Mobillity in soil: No data available
Partition coefficient: 4.38
n-octanol/water (log P_{ow})
Soil adsorption (Koc): No data available
Henry's Law: 1621
constant (PaM^3/mol)

13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.

Disposal of container: Dispose of as unused product. Do not re-use empty containers.

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2709	Butyl benzenes	3 Flammable liquid	III

IATA

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2709	Butylbenzenes	3 Flammable liquid	III

IMDG

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2709	Butylbenzenes	3 Flammable liquid	III

EmS number: F-E, S-D

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):
This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313: Not Listed
SARA 302: Not Listed

State Regulations

State Right-to-Know

Massachusetts Not Listed
New Jersey Listed
Pennsylvania Not Listed
California Proposition 65: Not Listed

Other Information

NFPA Rating:

Health: 0
Flammability: 2
Instability: 0

HMIS Classification:

Health: 0
Flammability: 2
Physical: 0

International Inventories

WHMIS hazard class: B2: Flammable Liquid.
D2B: Materials causing other toxic effects. (Toxic)

EC-No: 203-209-7

16. OTHER INFORMATION

Revision date: 10/06/2014
Revision number: 2

16. OTHER INFORMATION

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

o-XYLENE **ICSC: 0084 (August 2002)**

ortho-Xylene
1,2-Dimethylbenzene
o-Xylol

CAS #: 95-47-6
UN #: 1307
EC Number: 202-422-2

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 32°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 32°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Dizziness. Drowsiness. Headache. Nausea.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Remove all ignition sources. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from strong oxidants and strong acids.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

o-XYLENE **ICSC: 0084**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
Reacts with strong acids and strong oxidants.

Formula: $C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2
Boiling point: 144°C
Melting point: -25°C
Relative density (water = 1): 0.88
Solubility in water: none
Vapour pressure, kPa at 20°C: 0.7
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 32°C c.c.
Auto-ignition temperature: 463°C
Explosive limits, vol% in air: 0.9-6.7
Octanol/water partition coefficient as log Pow: 3.12

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes and skin. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system. Exposure to the substance may increase noise-induced hearing loss. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 100 ppm as TWA; 150 ppm as STEL; A4 (not classifiable as a human carcinogen); BEI issued.
MAK: 220 mg/m^3, 50 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: D.
EU-OEL: 221 mg/m^3, 50 ppm as TWA; 442 mg/m^3, 100 ppm as STEL; (skin)

ENVIRONMENT

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
The recommendations on this Card also apply to technical xylene.
See ICSCs 0085 and 0086.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn; R: 10-20/21-38; S: (2)-25; Note: C

PROPYLENE **ICSC: 0559 (November 1998)**

Methylethylene
Propene
Methylethene

CAS #: 115-07-1
UN #: 1077
EC Number: 204-062-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Extremely flammable. Gas/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding) if in liquid state.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with powder, carbon dioxide. In case of fire: keep cylinder cool by spraying with water. NO direct contact with water. Combat fire from a sheltered position.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Drowsiness. Suffocation. See Notes.	Use ventilation.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention .
Eyes	See Skin.	Wear safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Evacuate danger area! Consult an expert! Ventilation. Remove all ignition sources. NEVER direct water jet on liquid. Personal protection: chemical protection suit including self-contained breathing apparatus.	**According to UN GHS Criteria**
STORAGE	**Transportation** **UN Classification** UN Hazard Class: 2.1
Fireproof. Cool.	
PACKAGING	

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

PROPYLENE **ICSC: 0559**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS COMPRESSED LIQUEFIED GAS.

Physical dangers
The gas is heavier than air and may travel along the ground; distant ignition possible. The gas is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
Reacts violently with oxidants. This generates fire and explosion hazard.

Formula: C_3H_6 / CH_2CHCH_3
Molecular mass: 42.1
Boiling point: -48°C
Melting point: -185°C
Relative density (water = 1): 0.5
Solubility in water: poor
Vapour pressure, kPa at 25°C: 1158
Relative vapour density (air = 1): 1.5
Flash point: Flammable gas
Auto-ignition temperature: 460°C
Explosive limits, vol% in air: 2.4-10.3
Octanol/water partition coefficient as log Pow: 1.77

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation.

Effects of short-term exposure
Rapid evaporation of the liquid may cause frostbite. The substance may cause effects on the central nervous system. Exposure could cause lowering of consciousness. See Notes.

Inhalation risk
On loss of containment this substance can cause suffocation by lowering the oxygen content of the air in confined areas.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

TLV: 500 ppm as TWA; A4 (not classifiable as a human carcinogen)

ENVIRONMENT

NOTES

High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death.
Check oxygen content before entering area.
Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

ADDITIONAL INFORMATION

EC Classification
Symbol: F+; R: 12; S: (2)-9-16-33

p-XYLENE **ICSC: 0086 (August 2002)**

para-Xylene
1,4-Dimethylbenzene
p-Xylol
paraxylene

CAS #: 106-42-3
UN #: 1307
EC Number: 203-396-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Above 27°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 27°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Dizziness. Drowsiness. Headache. Nausea.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Remove all ignition sources. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from strong oxidants and strong acids.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

p-XYLENE **ICSC: 0086**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
Reacts with strong acids and strong oxidants.

Formula: $C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2
Boiling point: 138°C
Melting point: 13°C
Relative density (water = 1): 0.86
Solubility in water: none
Vapour pressure, kPa at 20°C: 0.9
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 27°C c.c.
Auto-ignition temperature: 528°C
Explosive limits, vol% in air: 1.1-7.0
Octanol/water partition coefficient as log Pow: 3.15

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes and skin. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system. Exposure to the substance may increase noise-induced hearing loss. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 100 ppm as TWA; 150 ppm as STEL; A4 (not classifiable as a human carcinogen); BEI issued.
MAK: 220 mg/m^3, 50 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: D.
EU-OEL: 221 mg/m^3, 50 ppm as TWA; 442 mg/m^3, 100 ppm as STEL; (skin)

ENVIRONMENT

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
The recommendations on this Card also apply to technical xylene.
See ICSCs 0084 and 0085.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn; R: 10-20/21-38; S: (2)-25; Note: C

TCI AMERICA

SAFETY DATA SHEET

Revision number: 2
Revision date: 10/06/2014

1. IDENTIFICATION

Product name: sec-Butylbenzene
Product code: B0714

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborgate Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

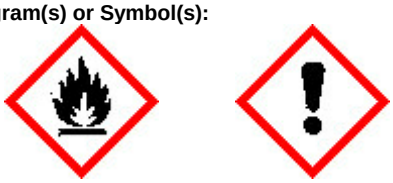
2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:
Acute Toxicity - Oral [Category 4]
Skin Corrosion/Irritation [Category 2]
Eye Damage/Irritation [Category 2B]
Flammable Liquids [Category 3]

Signal word: Warning!

Hazard Statement(s):
Causes eye irritation
Causes skin irritation
Flammable liquid and vapor
Harmful if swallowed

Pictogram(s) or Symbol(s):



Precautionary Statement(s):

[Prevention] Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Wear protective gloves. Keep away from heat, sparks, open flames or other hot surfaces. - No smoking. Keep container tightly closed. Ground or bond container and receiving equipment. Use explosion-proof electrical, ventilating, lighting, and equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wear protective gloves, eye protection and face protection.

[Response] If swallowed: Immediately call a poison center or doctor. Rinse mouth. If on skin: Wash with plenty of water. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. In case of fire: Use dry chemical, CO2, water spray or alcohol-resistant foam to extinguish.

[Storage] Store in a well-ventilated place. Keep cool.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance
Components: sec-Butylbenzene
Percent: >99.0%(GC)
CAS Number: 135-98-8
Molecular Weight: 134.22
Chemical Formula: $C_{10}H_{14}$
Synonyms: 2-Phenylbutane

4. FIRST-AID MEASURES

Inhalation: Call a poison center or doctor if you feel unwell. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact: Call a poison center or doctor if you feel unwell. Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Eye contact: IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Contact with material may irritate or burn eyes. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Harmful if swallowed. Do not induce vomiting with out medical advice. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: Redness.
Delayed: No data available

Immediate medical attention: WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is harmful. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO_2 , water spray, or alcohol-resistant foam. Consult with local fire authorities before attempting large scale fire fighting operations.

Specific hazards arising from the chemical
Hazardous combustion products: These products include: Carbon oxides
Other specific hazards: Closed containers may explode from heat of a fire.

Special precautions for fire-fighters:
Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient. Do not use straight streams. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Move containers from fire area if you can do it without risk.
Special protective equipment for fire-fighters:
Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Use spark-proof tools and explosion-proof equipment. Remove all sources of ignition. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

6. ACCIDENTAL RELEASE MEASURES

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

Emergency procedures: Isolate area until gas has dispersed. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:
ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). All equipment used when handling the product must be grounded. Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material.

Environmental precautions:
Keep away from living quarters. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Do NOT breath gas, fumes, vapor, or spray. Do not ingest. Avoid contact with skin and eyes. Keep away from heat and sources of ignition. Use explosion-proof equipment. Use only non-sparking hand tool when handling this product. Ground all equipment containing material. Take measures to prevent build up of electrostatic charge. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Keep containers tightly closed in a cool, well-ventilated place. Keep away from sources of ignition. Store and use away from heat, sparks, open flame, or any other ignition source. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Combustible substances, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

Appropriate engineering controls:
Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection: Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection: Wear protective gloves.
Eye protection: Splash goggles.
Skin and body protection: Lab coat.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid
Form: Clear
Color: Colorless - Almost colorless
Odor: No data available
Odor threshold: No data available

Melting point/freezing point:	-83°C (-117°F)	**pH:**	No data available
Boiling point/range:	173°C (343°F)	**Vapor pressure:**	0.2kPa/25°C
Decomposition temperature:	No data available	**Vapor density:**	4.62
Relative density:	0.86	**Dynamic Viscosity:**	No data available
Kinematic Viscosity:	No data available		
Partition coefficient: n-octanol/water (log P_{ow})	4.57	**Evaporation rate:** (Butyl Acetate = 1)	No data available
Flash point:	52°C (126°F)	**Autoignition temperature:**	415°C (779°F)
Flammability (solid, gas):	No data available	**Flammability or explosive limits:**	
		Lower:	0.8%
		Upper:	6.9%

Solubility(ies):

9. PHYSICAL AND CHEMICAL PROPERTIES

Water: Insoluble (17.6mg/L, 25°C)
Miscible: Ether, Alcohols, Benzene

10. STABILITY AND REACTIVITY

Reactivity: Not Available.
Chemical Stability: Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions: In use, may form flammable/explosive vapor-air mixture.
Conditions to avoid: Avoid excessive heat and light.
Incompatible materials: Strong oxidizing agents
Hazardous Decomposition Products: No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: CY9100000

Acute Toxicity:
orl-mus LD50:8700 mg/kg orl-rat LD50:2240 uL/kg

skn-rbt LD50:>16 mL/kg

Skin corrosion/irritation:
skn-rbt 100 mg/24H MOD

Serious eye damage/irritation:
eye-rbt 500 mg/24H MLD

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
No data available

Carcinogenicity:

No data available

IARC: No data available **NTP:** No data available **OSHA:** No data available

Reproductive toxicity:
No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.
Symptoms related to exposure:
Overexposure may result in serious illness or death. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Skin contact may result in redness, pain or dry skin. Eye contact may result in redness or pain.
Potential Health Effects:
Skin and eye contact may result in irritation.
Target organ(s): No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity
Fish: No data available
Crustacea: No data available
Algae: No data available

Persistence and degradability: No data available
Bioaccumulative potential (BCF): 660
Mobillity in soil: No data available
Partition coefficient: 4.57
n-octanol/water (log P_{ow})
Soil adsorption (Koc): 7200
Henry's Law: 182.3
constant (PaM^3/mol)

13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.

Disposal of container: Dispose of as unused product. Do not re-use empty containers.

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2709	Butyl benzenes	3 Flammable liquid	III

IATA

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2709	Butylbenzenes	3 Flammable liquid	III

IMDG

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2709	Butylbenzenes	3 Flammable liquid	III

EmS number: F-E, S-D

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):
This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313: Not Listed
SARA 302: Not Listed

State Regulations

State Right-to-Know

Massachusetts Not Listed
New Jersey Not Listed
Pennsylvania Not Listed
California Proposition 65: Not Listed

Other Information

NFPA Rating:

Health: 0
Flammability: 2
Instability: 0

HMIS Classification:

Health: 0
Flammability: 2
Physical: 0

International Inventories

WHMIS hazard class: B2: Flammable Liquid.
D2A: Materials causing other toxic effects. (Very Toxic)
D2B: Materials causing other toxic effects. (Toxic)

EC-No: 205-227-0

16. OTHER INFORMATION

Revision date: 10/06/2014
Revision number: 2

16. OTHER INFORMATION

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

STYRENE **ICSC: 0073 (April 2006)**

Vinylbenzene
Phenylethylene
Ethenylbenzene

CAS #: 100-42-5
UN #: 2055
EC Number: 202-851-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Gives off irritating or toxic fumes (or gases) in a fire. Above 31°C explosive vapour/air mixtures may be formed. See Notes.	NO open flames, NO sparks and NO smoking. Above 31°C use a closed system, ventilation and explosion-proof electrical equipment.	Use dry powder. Use foam. Use carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Dizziness. Drowsiness. Headache. Nausea. Vomiting. Weakness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain.	Protective clothing. Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Rest.

SPILLAGE DISPOSAL

Personal protection: chemical protection suit including self-contained breathing apparatus. Remove all ignition sources. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from incompatible materials. See Chemical Dangers. Cool. Keep in the dark. Store only if stabilized. Store in an area without drain or sewer access.

PACKAGING

Airtight.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Flammable liquid and vapour
Harmful if inhaled
Causes skin and eye irritation
Suspected of causing cancer
Causes damage to the central nervous system and the liver through prolonged or repeated exposure
Toxic to aquatic life

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

STYRENE	ICSC: 0073

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-YELLOW OILY LIQUID.

Physical dangers

Chemical dangers
The substance can form explosive peroxides. The substance may polymerize due to warming, under the influence of light, oxidants, oxygen and peroxides. This generates fire and explosion hazard. Reacts violently with strong acids and strong oxidants. This generates fire and explosion hazard. Attacks rubber, copper and copper alloys.

Formula: C_8H_8 / $C_6H_5CHCH_2$
Molecular mass: 104.2
Boiling point: 145°C
Melting point: -30.6°C
Relative density (water = 1): 0.91
Solubility in water, g/100ml at 20°C: 0.03
Vapour pressure, kPa at 20°C: 0.67
Relative vapour density (air = 1): 3.6
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 31°C c.c.
Auto-ignition temperature: 490°C
Explosive limits, vol% in air: 0.9-6.8
Octanol/water partition coefficient as log Pow: 3.0

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure at high levels could cause unconsciousness.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system. Exposure to the substance may increase noise-induced hearing loss. This substance is possibly carcinogenic to humans. See Notes.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; 20 ppm as STEL; (OTO); A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.
MAK: 86 mg/m^3, 20 ppm; peak limitation category: II(2); carcinogen category: 5; pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Check for peroxides prior to distillation; eliminate if found.
Styrene monomer vapours are uninhibited and may form polymers in vents or flame arresters of storage tanks, resulting in blockage of vents.
Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn; R: 10-20-36/38; S: (2)-23; Note: D

TETRACHLOROETHYLENE **ICSC: 0076 (April 2013)**

PER
Ethylene Tetrachloride
PERC
Tetracap
1,1,2,2-tetrachloroethene
1,1,2,2-Tetrachloroethylene
Perchloroethylene
Tetrachloroethene

CAS #: 127-18-4
UN #: 1897
EC Number: 204-825-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with metals. See Chemical Dangers.	NO open flames, NO sparks and NO smoking. NO contact with hot surfaces or finely divided metals. NO contact with metals. See Chemical Dangers	In case of fire in the surroundings, use appropriate extinguishing media.

STRICT HYGIENE! PREVENT GENERATION OF MISTS!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Cough. Dizziness. Headache. Drowsiness. Nausea. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	Dry skin. Redness. Burning sensation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Burning sensation. Pain.	Wear safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Sore throat. Aspiration hazard! See Inhalation. Cardiac dysrhythmia. Respiratory arrest.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance and complete protective clothing. Ventilation. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from metals, ignition sources and food and feedstuffs. See Chemical Dangers. Keep in the dark. Keep in a well-ventilated room. Dry. Cool.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

Causes skin irritation
Suspected of causing cancer
May be harmful if swallowed and enters airways
May cause drowsiness or dizziness
Toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

TETRACHLOROETHYLENE **ICSC: 0076**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

Chemical dangers
Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive fumes of hydrogen chloride, phosgene and chlorine. Decomposes slowly on contact with moisture. This produces trichloroacetic acid and hydrochloric acid. Reacts violently with finely divided metals. This generates fire and explosion hazard.

Formula: C_2Cl_4 / $Cl_2C=CCl_2$
Molecular mass: 165.8
Boiling point: 121°C
Melting point: -22°C
Density (at 20°C): 1.62 g/cm³
Solubility in water, g/100ml at 20°C: 0.015
Vapour pressure, kPa at 20°C: 1.9
Relative vapour density (air = 1): 5.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.09
Octanol/water partition coefficient as log Pow: 3.4
Auto-ignition temperature: > 650°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, by ingestion and through the skin.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis. The substance may cause effects on the central nervous system. Exposure at high levels could cause unconsciousness.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver, kidneys and central nervous system. This substance is probably carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 25 ppm as TWA; 100 ppm as STEL; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.
MAK: 69 mg/m^3, 10 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 3; pregnancy risk group: C.
EU-OEL: 138 mg/m^3, 20 ppm as TWA; 275 mg/m^3, 40 ppm as STEL; (skin)

ENVIRONMENT

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
The odour warning when the exposure limit value is exceeded is insufficient.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.
Use of alcoholic beverages enhances the harmful effect.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 40-51/53; S: (2)-23-36/37-61

TETRAHYDROFURAN **ICSC: 0578 (November 2019)**

Tetramethylene oxide
Diethylene oxide
1,4-Epoxybutane
Oxacyclopentane

CAS #: 109-99-9
UN #: 2056
EC Number: 203-726-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	Use alcohol-resistant foam, water spray, powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS! STRICT HYGIENE!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Burning sensation in the throat and chest. Dizziness. Headache. Nausea. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention.
Skin	Dry skin. Redness. Pain.	Protective gloves. Protective clothing.	First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles or face shield.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Evacuate danger area! Consult an expert! Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Remove all ignition sources. Ventilation. Do NOT wash away into sewer. Collect leaking liquid in sealable air tight containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Well closed. Separated from : see Chemical Dangers.

PACKAGING

Airtight.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Highly flammable liquid and vapour
Harmful if swallowed
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation
Suspected of causing cancer
May cause damage to kidneys and liver through prolonged or repeated exposure

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

TETRAHYDROFURAN **ICSC: 0578**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers
The substance can form explosive peroxides. Reacts violently with strong oxidants, strong bases and some metal halides. This generates fire and explosion hazard. Attacks some forms of plastic, rubber and coatings.

Formula: C_4H_8O / $(CH_2)_3CH_2O$
Molecular mass: 72.1
Boiling point: 66°C
Melting point: -108.5°C
Relative density (water = 1): 0.89
Solubility in water: freely soluble
Vapour pressure, kPa at 20°C: 19.3
Relative vapour density (air = 1): 2.5
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.28
Flash point: -14.5°C c.c.
Auto-ignition temperature: 321°C
Explosive limits, vol% in air: 2-11.8
Octanol/water partition coefficient as log Pow: 0.46 (estimated)
Viscosity: 0.5 mPa*s at 20°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour, by ingestion and through the skin.

Effects of short-term exposure
The substance and the vapour are irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system at high levels. This may result in narcosis.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidneys. This may result in impaired functions. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 50 ppm as TWA; 100 ppm as STEL; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: 150 mg/m^3, 50 ppm; peak limitation category: I(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.
EU-OEL: 150 mg/m^3, 50 ppm as TWA; 300 mg/m^3, 100 ppm as STEL; (skin)

ENVIRONMENT

NOTES

The odour warning when the exposure limit value is exceeded is insufficient.
Check for peroxides prior to distillation; eliminate if found.

ADDITIONAL INFORMATION

EC Classification

TOLUENE **ICSC: 0078 (October 2002)**

Methylbenzene
Toluol
Phenylmethane

CAS #: 108-88-3
UN #: 1294
EC Number: 203-625-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Vapour/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	Use powder, AFFF, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Dizziness. Drowsiness. Headache. Nausea. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Evacuate danger area! Consult an expert! Personal protection: chemical protection suit and self-contained breathing apparatus. Ventilation. Remove all ignition sources. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from strong oxidants.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

TOLUENE **ICSC: 0078**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour mixes well with air, explosive mixtures are easily formed. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
Reacts violently with strong oxidants. This generates fire and explosion hazard.

Formula: $C_6H_5CH_3$ / C_7H_8
Molecular mass: 92.1
Boiling point: 111°C
Melting point: -95°C
Relative density (water = 1): 0.87
Solubility in water: none
Vapour pressure, kPa at 25°C: 3.8
Relative vapour density (air = 1): 3.1
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01
Flash point: 4°C c.c.
Auto-ignition temperature: 480°C
Explosive limits, vol% in air: 1.1-7.1
Octanol/water partition coefficient as log Pow: 2.69

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure at high levels could cause cardiac dysrhythmia and unconsciousness.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system. Exposure to the substance may increase noise-induced hearing loss. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 20 ppm as TWA; (OTO); A4 (not classifiable as a human carcinogen); BEI issued.
MAK: 190 mg/m^3, 50 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: C.
EU-OEL: 192 mg/m^3, 50 ppm as TWA; 384 mg/m^3, 100 ppm as STEL; (skin)

ENVIRONMENT

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Use of alcoholic beverages enhances the harmful effect.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, Xn; R: 11-38-48/20-63-65-67; S: (2)-36/37-46-62

Avocado Research Chemicals Ltd - Material Safety Data Sheet 10384

1. IDENTIFICATION OF SUBSTANCE AND SUPPLIER

Name On Label	trans-1,2-Dichloroethylene
Product Number	10384
Supplier	Johnson Matthey Catalog Company Inc. 30 Bond Street, Ward Hill, Massachusetts, 01835-8099 Emergency Telephone Number: (978) 521-6300; CHEMTREC: (800) 424-9300
Alternative Names	None in common use.

2. COMPOSITION AND INFORMATION ON COMPONENTS

Name	trans-1,2-Dichloroethylene		
Minor Impurities	Not determined		
CAS No.	156-60-5	**EINECS No.** 2058602	**EEC No.**

3. HAZARDS IDENTIFICATION

Designation HIGHLY FLAMMABLE ~ IRRITANT

Risk Phrases

R11	Highly flammable.
R20/21/22	Harmful by inhalation, in contact with skin and if swallowed.
R36/37/38	Irritating to eyes, respiratory system and skin.

4. FIRST AID MEASURES

Inhalation	Remove to fresh air. If breathing is difficult give oxygen and seek medical attention.
Eye Contact	Flush with copious amounts of water for at least 15 minutes. If irritation persists, seek medical attention.
Skin Contact	Remove contaminated clothing. Wash affected area with soap and water. Rinse thoroughly. If irritation persists or other symptoms are observed, seek medical advice.
Ingestion	Rinse out mouth and drink lots of water. In case of irritation or other symptoms, seek medical attention.

5. FIRE FIGHTING MEASURES

Extinguishing Medium	Use fire fighting measures which suit the environment and take into account other materials which may be involved. In general, water-based extinguishers should not be used for fires involving organic materials. Use carbon dioxide or dry powder.
Protective Equipment	Wear self-contained breathing apparatus and protective clothing.

Hazardous Products of Combustion may include: carbon monoxide, carbon dioxide, hydrogen chloride (hydrochloric acid).

6. ACCIDENTAL RELEASE MEASURES

Personal Protection	Keep away from ignition sources. Avoid inhalation of vapour. Wear protective equipment including rubber gloves, eye protection and breathing equipment. Keep unprotected persons away.
Environmental Protection	Take precautions to ensure product does not contaminate the ground or enter the drainage system.
Collection	Absorb in vermiculite or proprietary absorbent material and transfer to sealed containers for disposal.

7. HANDLING AND STORAGE

Handling	Chemicals should be used only by those trained in handling potentially hazardous materials. Rubber gloves, eye protection and protective clothing should be worn. Operations should be carried out in an efficient fume hood or equivalent system.
Storage	Store in tightly sealed containers in a cool place. Protect from moisture.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Respiratory	Volatile product. Avoid inhalation of vapour. Handle in an efficient fume hood or equivalent system.
Eye	Avoid eye contact. Wear safety spectacles, goggles or, for larger quantities, a full face mask.
Hands and Body	Irritant product. Avoid skin contact. Wear rubber gloves, protective clothing and, for larger quantities, full arm, body and face protection. Wash hands thoroughly after handling.

Continued on next page...

10384 continued.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Colorless liquid		
Physical Constants	Not available		
Molecular formula	$C_2H_2Cl_2$	**Formula Wt.**	96.94
Water solubility	Sl sol	**Density**	1.257
Flash Point	6˚		

10. STABILITY AND REACTIVITY

Specific Hazard

Incompatibilities	Oxidising agents.
Decomposition	Hazardous products of decomposition may include: carbon monoxide, carbon dioxide, hydrogen chloride (hydrochloric acid).

11. TOXICOLOGICAL INFORMATION

RTECS No.	KV9400000
Acute Toxicity	LD_{50}: ORL-RAT 1235mg/kg; SKN-RBT >5gm/kg Harmful by inhalation, in contact with skin and if swallowed. Irritating to eyes, respiratory system and skin.
Special Note	Symptoms of exposure may include nausea, dizziness and headache. Prolonged exposure can have a narcotic effect.
Chronic Toxicity	Possible mutagen. May cause damage to the heart, bone marrow and the gastrointestinal and immune systems.

12. ECOLOGICAL EFFECTS

General	Take care to prevent chemicals from entering the ground, water courses or drainage systems.

13. DISPOSAL CONSIDERATIONS

Disposal	Disposal should be via an approved contractor and should take full account of local regulations.

14. TRANSPORT INFORMATION

UN Number	1150		
Land Transport	ADR/RIC Code/Class	3.2	Packing Group II
Maritime Transport	IMDG Code/Class	3.2	Packing Group II
Air Transport	IATA Code/Class	3.2	Packing Group II

15. REGULATORY INFORMATION

CAS No. 156-60-5 **EINECS No.** 2058602 **EEC No.** **UN No.** 1150 **RTECS No.** KV9400000

Hazard Indication	HIGHLY FLAMMABLE ~ IRRITANT
Risk & Safety Phrases	Highly flammable. Harmful by inhalation, in contact with skin and if swallowed. Irritating to eyes, respiratory system and skin. Keep container tightly closed. Keep away from sources of ignition - No Smoking. Do not empty into drains. Wear suitable protective clothing.
TSCA	Listed substance.

16. OTHER INFORMATION

It must be recognised that the physical and chemical properties of any product may not be fully understood and that new, possibly hazardous products may arise from reactions between chemicals. The information given in this data sheet is based on our present knowledge and shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

Date of Last Review: 3rd August 1998 **Date Printed:** 18th September 1998

TCI AMERICA

SAFETY DATA SHEET

Revision number: 4
Revision date: 08/15/2016

1. IDENTIFICATION

Product name: trans-1,3-Dichloropropene
Product code: D2346

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborgate Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:
Acute Toxicity - Oral [Category 3]
Acute Toxicity - Dermal [Category 3]
Acute Toxicity - Inhalation [Category 3]
Skin Corrosion/Irritation [Category 2]
Eye Damage/Irritation [Category 2A]
Sensitization - Skin [Category 1]
Carcinogenicity [Category 2]
Specific Target Organ Toxicity (Single Exposure) [Category 2]
Specific Target Organ Toxicity (Repeated Exposure) [Category 2]
Flammable Liquids [Category 3]
Aquatic Hazard (Acute) [Category 1]
Aquatic Hazard (Long-Term) [Category 1]

Signal word: Danger!

Hazard Statement(s):
Causes serious eye irritation
Causes skin irritation
Flammable liquid and vapor
May cause an allergic skin reaction
Suspected of causing cancer
Toxic if swallowed
Toxic in contact with skin
Toxic if inhaled
Very toxic to aquatic life
Very toxic to aquatic life with long lasting effects
May cause damage to organs: Respiratory System
May cause damage to organs: Digestive Tract through prolonged or repeated exposure.

Pictogram(s) or Symbol(s):

Precautionary Statement(s):

2. HAZARD(S) IDENTIFICATION

[Prevention] Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Wear protective gloves and protective clothing. Do not breathe fume, mist, vapors or spray. Use only outdoors or in a well-ventilated area. Wear protective gloves. Wear eye and face protection. Avoid breathing dusts or mists. Contaminated work clothing must not be allowed out of the workplace. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves, protective clothing, eye protection and face protection. Wash all exposed skin thoroughly after handling. Keep away from heat, sparks, open flames or other hot surfaces. - No smoking. Keep container tightly closed. Ground or bond container and receiving equipment. Use explosion-proof electrical, ventilating, lighting, and equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wear protective gloves, eye protection and face protection.

[Response] If swallowed: Immediately call a poison center or doctor. Rinse mouth. If on skin: Wash with plenty of water. Call a poison center or doctor if you feel unwell. Take off immediately all contaminated clothing and wash it before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a poison center or doctor. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse. If exposed or concerned: Get medical advice or attention. If exposed or concerned: Call a poison center or doctor. Get medical advice or attention if you feel unwell. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. In case of fire: Use dry chemical, CO2, water spray or alcohol-resistant foam to extinguish.

[Storage] Store locked up. Store in a well-ventilated place. Keep container tightly closed. Store in a well-ventilated place. Keep cool.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance
Components: trans-1,3-Dichloropropene
Percent: >98.0%(GC)
CAS Number: 10061-02-6
Molecular Weight: 110.97
Chemical Formula: $C_3H_4Cl_2$

4. FIRST-AID MEASURES

Inhalation: May cause coughing, difficult breathing and nausea. Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed. Inhalation of vapors or contact with substance will result in contamination and potential harmful effects. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact: Immediately call a poison center or doctor. Effects of exposure (skin contact) to substance may be delayed. Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Eye contact: IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Contact with material may irritate or burn eyes. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Toxic if swallowed. Do not induce vomiting with out medical advice. Effects of exposure (ingestion) to substance may be delayed. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: Redness.
Delayed: May cause skin sensitization. Possibly carcinogenic to humans.

4. FIRST-AID MEASURES

Immediate medical attention: WARNING: It might be dangerous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is toxic. CAUTION: Victim may be a source of contamination. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO_2 or water spray. Consult with local fire authorities before attempting large scale fire fighting operations.

Specific hazards arising from the chemical

Hazardous combustion products: These products include: Carbon oxides Halogenated compounds

Other specific hazards: WARNING: Highly toxic HCl gas is produced during combustion.

Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient. Do not use straight streams. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Move containers from fire area if you can do it without risk.

Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Use spark-proof tools and explosion-proof equipment. Remove all sources of ignition. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Wear protective clothing (chemical resistant suit and chemical resistant boots). Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

Emergency procedures: Isolate area until gas has dispersed. Do not clean-up or dispose except under supervision of a specialist. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:

ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). All equipment used when handling the product must be grounded. Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material.

Environmental precautions:

Keep away from living quarters. Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Do NOT breath gas, fumes, vapor, or spray. Manipulate under an adequate fume hood. Do not ingest. Avoid contact with skin and eyes. Avoid contact with skin. Avoid exposure - obtain special instructions before use. Avoid prolonged or repeated exposure. Normal measures for preventive fire protection. Keep away from heat and sources of ignition. Use explosion-proof equipment. Use only non-sparking hand tool when handling this product. Ground all equipment containing material. Take measures to prevent build up of electrostatic charge. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Store locked up. Keep containers tightly closed in a cool, well-ventilated place. Keep away from sources of ignition. Store and use away from heat, sparks, open flame, or any other ignition source. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods. Store under inert gas (e.g. Argon). Store in a freezer.

Storage incompatibilities: Combustible substances, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Appropriate engineering controls:
Handle only in a fully enclosed system and equipment. Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection:	Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection:	Wear protective gloves.
Eye protection:	Splash goggles.
Skin and body protection:	Wear protective clothing (chemical resistant suit and chemical resistant boots).

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C):	Liquid
Form:	Clear
Color:	Colorless - Pale yellow
Odor:	Pungent
Odor threshold:	No data available

Melting point/freezing point:	No data available	**pH:**	No data available
Boiling point/range:	112°C (234°F)	**Vapor pressure:**	No data available
Decomposition temperature:	No data available	**Vapor density:**	No data available
Relative density:	1.22	**Dynamic Viscosity:**	No data available
Kinematic Viscosity:	No data available		
Partition coefficient: n-octanol/water (log P_{ow})	1.41	**Evaporation rate:** (Butyl Acetate = 1)	No data available
Flash point:	21°C (70°F)	**Autoignition temperature:**	No data available
Flammability (solid, gas):	No data available	**Flammability or explosive limits:**	
		Lower:	5.3%
		Upper:	14.5%

Solubility(ies):
Water: Very slightly soluble
Soluble: Ether, Benzene, Chloroform

10. STABILITY AND REACTIVITY

Reactivity:	Not Available.
Chemical Stability:	Air sensitive. Heat sensitive.
Possibility of Hazardous Reactions:	In use, may form flammable/explosive vapor-air mixture.
Conditions to avoid:	Air sensitive. Exposure to air. Heat sensitive.
Incompatible materials:	Oxidizing agents
Hazardous Decomposition Products:	No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: UC8320000

Acute Toxicity:
No data available

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
mmo-sat 20 ug/plate(+/-S9)

dns-hmn-hla 100 umol/L

Carcinogenicity:

No data available

IARC:	Group 2B (Possibly carcinogenic to humans) .	**NTP:**	b (Reasonably anticipated to be carcinogens).	**OSHA:**	No data available

Reproductive toxicity:
No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.
Symptoms related to exposure:
Overexposure may result in serious illness or death. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Skin contact may result in redness, pain or dry skin. Eye contact may result in redness or pain. Skin contact may result in sensitization. Readily absorbed through skin.
Potential Health Effects:
Skin and eye contact may result in irritation.
Target organ(s):
May cause damage to organs: Respiratory System
May cause damage to organs: Digestive Tract through prolonged or repeated exposure.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Fish:	No data available
Crustacea:	No data available
Algae:	No data available

Persistence and degradability:	No data available
Bioaccumulative potential (BCF):	<2.5(conc. 34.6 ug/L), <26(conc. 26 ug/L)
Mobillity in soil:	No data available
Partition coefficient: n-octanol/water (log P_{ow})	1.41
Soil adsorption (Koc):	No data available
Henry's Law: constant (PaM^3/mol)	No data available

13. DISPOSAL CONSIDERATIONS

Disposal of product:	Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.
Disposal of container:	Dispose of as unused product. Do not re-use empty containers.
Other considerations:	Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)

UN number:	**Proper Shipping Name:**	**Class or Division:**	**Packing Group:**
UN2047	Dichloropropenes	3 Flammable liquid	II

IATA

UN number:	**Proper Shipping Name:**	**Class or Division:**	**Packing Group:**
UN2047	Dichloropentanes	3 Flammable liquid	II

IMDG

UN number:	**Proper Shipping Name:**	**Class or Division:**	**Packing Group:**
UN2047	Dichloropropenes	3 Flammable liquid	II

EmS number:	F-E, S-D
Reportable Quantitiy:	100 Pounds (45.4 Kilograms)

15. REGULATORY INFORMATION

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):
This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313:	Listed
SARA 302:	Not Listed

State Regulations

State Right-to-Know

Massachusetts	Listed
New Jersey	Not Listed
Pennsylvania	Listed
California Proposition 65:	Not Listed

Other Information

NFPA Rating:

Health:	2
Flammability:	3
Instability:	0

HMIS Classification:

Health:	2
Flammability:	3
Physical:	0

International Inventories

WHMIS hazard class:
B2: Flammable Liquid.
D1B: Materials causing immediate and serious toxic effects. (Toxic)
D2B: Materials causing other toxic effects. (Toxic)

16. OTHER INFORMATION

Revision date: 08/15/2016
Revision number: 4
TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

TRICHLOROETHYLENE **ICSC: 0081 (April 2013)**

1,1,2-Trichloroethylene
Trichloroethene
Ethylene trichloride
Acetylene trichloride
Tri
Chlorylen
TCE
Trilene
Trichlor

CAS #: 79-01-6
UN #: 1710
EC Number: 201-167-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. See Notes. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks and NO smoking. NO contact with hot surfaces, strong bases or finely divided metals. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS! AVOID ALL CONTACT!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Dizziness. Drowsiness. Headache. Weakness. Nausea. Unconsciousness.	Use closed system.	Fresh air, rest. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	Dry skin. Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Sore throat. Aspiration hazard! See Inhalation. Cardiac dysrhythmia. Respiratory arrest.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance and complete protective clothing. Ventilation. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from metals, strong bases, food and feedstuffs, combustible substances and ignition sources. See Chemical Dangers. Dry. Keep in the dark. Keep in a well-ventilated room. Cool.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

May be harmful if swallowed
Causes skin irritation
Causes serious eye irritation
Suspected of causing genetic defects
May cause cancer
May cause drowsiness or dizziness
May be harmful if swallowed and enters airways
Harmful to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

TRICHLOROETHYLENE **ICSC: 0081**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive fumes of phosgene and hydrogen chloride. Decomposes on contact with strong alkali. This produces dichloroacetylene. This increases fire hazard. Reacts violently with finely divided metals. This generates fire and explosion hazard. Slowly decomposed by light in the presence of moisture. This produces corrosive hydrochloric acid.

Formula: C_2HCl_3 / $ClCH=CCl_2$
Molecular mass: 131.4
Boiling point: 87°C
Melting point: -86°C
Relative density (water = 1): 1.5 (20°C)
Solubility in water, g/100ml at 20°C: 0.1
Vapour pressure, kPa at 20°C: 7.8
Relative vapour density (air = 1): 4.5
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.3
Auto-ignition temperature: 410°C
Explosive limits, vol% in air: 7.9 - 100
Octanol/water partition coefficient as log Pow: 2.42
Electrical conductivity: 800 pS/m

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, by ingestion and through the skin.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis. The substance may cause effects on the central nervous system, liver and kidneys. This may result in impaired functions. Exposure at high concentrations could cause unconsciousness.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the central nervous system. This may result in fatigue, irritability and mental and memory disturbances. The substance may have effects on the liver, kidneys and immune system. This substance is carcinogenic to humans. Causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; 25 ppm as STEL; A2 (suspected human carcinogen); BEI issued.
MAK: skin absorption (H); carcinogen category: 1; germ cell mutagen group: 3B.
EU-OEL: 54.7 mg/m^3, 10 ppm as TWA; 164.1 mg/m^3, 30 ppm as STEL; (skin)

ENVIRONMENT

The substance is harmful to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES

Combustible vapour/air mixtures difficult to ignite, may be developed under certain conditions.
Use of alcoholic beverages enhances the harmful effect.
Depending on the degree of exposure, periodic medical examination is suggested.
The odour warning when the exposure limit value is exceeded is insufficient.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION

EC Classification
Symbol: T; R: 45-36/38-52/53-67; S: 53-45-61

TRICHLOROFLUOROMETHANE **ICSC: 0047 (July 2002)**

Trichloromonofluoromethane
Fluorotrichloromethane
CFC 11
R 11

CAS #: 75-69-4

EC Number: 200-892-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Irregular heartbeat. Confusion. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE. Dry skin.	Cold-insulating gloves.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Ventilation.	**According to UN GHS Criteria**
STORAGE	
Separated from incompatible materials. See Chemical Dangers. Cool.	**Transportation** **UN Classification**
PACKAGING	

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

TRICHLOROFLUOROMETHANE **ICSC: 0047**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS GAS OR HIGHLY VOLATILE LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The gas is heavier than air. The vapour is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

Chemical dangers
Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive gases of hydrogen chloride (see ICSC 0163), phosgene (see ICSC 0007), hydrogen fluoride (see ICSC 0283) and carbonyl fluoride (see ICSC 0633). Reacts with powdered aluminium, powdered zinc, magnesium shavings, lithium shavings and granular barium.

Formula: CCl_3F
Molecular mass: 137.4
Boiling point: 24°C
Melting point: -111°C
Relative density (water = 1): 1.49
Solubility in water, g/100ml at 20°C: 0.1
Vapour pressure, kPa at 20°C: 89.0
Relative vapour density (air = 1): 4.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 4.4
Octanol/water partition coefficient as log Pow: 2.53

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation.

Effects of short-term exposure
The liquid may cause frostbite. The substance may cause effects on the cardiovascular system and central nervous system. This may result in cardiac disorders and central nervous system depression. Exposure could cause lowering of consciousness. See Notes.

Inhalation risk
On loss of containment this substance can cause suffocation by lowering the oxygen content of the air in confined areas.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1000 ppm as STEL; A4 (not classifiable as a human carcinogen).
MAK: 5700 mg/m^3, 1000 ppm; peak limitation category: II(2); pregnancy risk group: C

ENVIRONMENT

Avoid release to the environment because of its impact on the ozone layer.

NOTES

High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death.
Check oxygen content before entering area.
The occupational exposure limit value should not be exceeded during any part of the working exposure.
The odour warning when the exposure limit value is exceeded is insufficient.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.
Turn leaking cylinder with the leak up to prevent escape of gas in liquid state.

ADDITIONAL INFORMATION

EC Classification

1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE **ICSC: 0050 (July 2002)**

Trichlorotrifluoroethane
CFC 113
R 113

CAS #: 76-13-1

EC Number: 200-936-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Irregular heartbeat. Confusion. Drowsiness. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from metals and alloys. See Chemical Dangers. Cool. Ventilation along the floor.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE **ICSC: 0050**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS VOLATILE LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air and may accumulate in lowered spaces causing a deficiency of oxygen.

Chemical dangers
Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive gases of hydrogen chloride (see ICSC 0163), phosgene (see ICSC 0007), hydrogen fluoride (see ICSC 0283) and carbonyl fluoride (see ICSC 0633). Reacts violently with powdered metals. This generates fire and explosion hazard. Attacks magnesium and its alloys.

Formula: $C_2Cl_3F_3$ / $Cl_2FCCClF_2$
Molecular mass: 187.4
Boiling point: 48°C
Melting point: -36°C
Relative density (water = 1): 1.56
Solubility in water, g/100ml at 20°C: 0.02
Vapour pressure, kPa at 20°C: 36
Relative vapour density (air = 1): 6.5
Relative density of the vapour/air-mixture at 20°C (air = 1): 3.0
Auto-ignition temperature: 680°C
Octanol/water partition coefficient as log Pow: 3.30

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes. The substance may cause effects on the cardiovascular system and central nervous system. This may result in cardiac disorders and central nervous system depression. Exposure could cause lowering of consciousness. See Notes.

Inhalation risk
On loss of containment this substance can cause suffocation by lowering the oxygen content of the air in confined areas.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1000 ppm as TWA; 1250 ppm as STEL; A4 (not classifiable as a human carcinogen).
MAK: 3900 mg/m^3, 500 ppm; peak limitation category: II(2); pregnancy risk group: D

ENVIRONMENT

The substance is toxic to aquatic organisms. Avoid release to the environment because of its impact on the ozone layer.

NOTES

High concentrations in the air cause a deficiency of oxygen with the risk of unconsciousness or death.
Check oxygen content before entering area.
The odour warning when the exposure limit value is exceeded is insufficient.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION

EC Classification

VINYL CHLORIDE **ICSC: 0082 (April 2017)**

Chloroethene
Chloroethylene
Vinylchloride Monomer (VCM)

CAS #: 75-01-4
UN #: 1086 (stabilized)
EC Number: 200-831-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Extremely flammable. Gives off irritating or toxic fumes (or gases) in a fire. Gas/air mixtures are explosive.	NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non-sparking handtools.	Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out. In other cases extinguish with powder, carbon dioxide, water spray. See Notes. In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Dizziness. Drowsiness. Headache. Unconsciousness. Blurred vision. Numbness. Tingling sensation.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention.
Skin	ON CONTACT WITH LIQUID: FROSTBITE.	Protective gloves. Cold-insulating gloves. Protective clothing.	ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer immediately for medical attention.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL

Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Ventilation. Remove all ignition sources. Remove vapour cloud with fine water spray. NEVER direct water jet on liquid.

STORAGE

Fireproof. Separated from : see Chemical Dangers. Cool. Store only if stabilized. Well closed. Keep in a well-ventilated room. Separated from oxidizing materials.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Extremely flammable gas
Contains gas under pressure; may explode if heated
May cause drowsiness or dizziness
May cause damage to liver through prolonged or repeated exposure
Suspected of causing genetic defects
May cause cancer

Transportation
UN Classification
UN Hazard Class: 2.1

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

VINYL CHLORIDE **ICSC: 0082**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS COMPRESSED LIQUEFIED GAS WITH CHARACTERISTIC ODOUR.

Physical dangers
The gas is heavier than air and may travel along the ground; distant ignition possible. Vapours are uninhibited and may polymerize, causing blockage of vents.

Chemical dangers
The substance can form explosive peroxides under specific circumstances. The substance readily polymerizes due to heating and under the influence of air, light and on contact with a catalyst, strong oxidizing agents and metals such as copper and aluminium. This generates fire or explosion hazard. Decomposes on burning. This produces toxic and corrosive fumes of hydrogen chloride and phosgene. Attacks iron and steel in the presence of moisture.

Formula: C_2H_3Cl / $H_2C=CHCl$
Molecular mass: 62.5
Boiling point: -13°C
Melting point: -154°C
Relative density (water = 1): 0.9 (liquid)
Density (vapour at 15°C): 8 g/l
Solubility in water, g/l at 25°C: 1.1 (poor)
Relative vapour density (air = 1): 2.2
Vapour pressure, kPa at 20°C: 334
Flash point: -78°C c.c.
Auto-ignition temperature: 472°C
Explosive limits, vol% in air: 3.6-33
Octanol/water partition coefficient as log Pow: 1.6

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation.

Effects of short-term exposure
The liquid may cause frostbite. The substance is irritating to the eyes. The substance may cause effects on the central nervous system. This may result in lowering of consciousness, convulsions and seizures. Medical observation is indicated.

Inhalation risk
A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

Effects of long-term or repeated exposure
The substance may have effects on the liver, spleen, blood, peripheral blood vessels and tissue and bones of the fingers. Animal tests show that this substance possibly causes toxicity to human reproduction or development. This substance is carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1 ppm as TWA; A1 (confirmed human carcinogen).
EU-OEL: 2.6 mg/m^3, 1 ppm as TWA.
MAK: carcinogen category: 1

ENVIRONMENT

This substance may be hazardous to the environment. Special attention should be given to ground water contamination.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
The odour warning when the exposure limit value is exceeded is insufficient.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.
An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.
Large fires of this material are practically inextinguishable: use water spray or fog.

ADDITIONAL INFORMATION

EC Classification
Symbol: F+, T; R: 45-12; S: 53-45; Note: D

BIPHENYL **ICSC: 0106 (October 2006)**

Diphenyl
Phenylbenzene
Dibenzene

CAS #: 92-52-4
UN #: 3077
EC Number: 202-163-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Finely dispersed particles form explosive mixtures in air.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust. Prevent build-up of electrostatic charges (e.g., by grounding).	Use water spray, foam, powder, carbon dioxide.

PREVENT DISPERSION OF DUST!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Nausea. Vomiting.	Avoid inhalation of dust and mist. Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection if powder.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible).
Ingestion	Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Separated from food and feedstuffs and oxidants. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

Causes eye irritation
May cause damage to liver and nervous system through prolonged or repeated exposure if inhaled
Very toxic to aquatic life

Transportation
UN Classification
UN Hazard Class: 9; UN Pack Group: III

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

BIPHENYL **ICSC: 0106**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
WHITE CRYSTALS OR FLAKES WITH CHARACTERISTIC ODOUR.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
Reacts with oxidants.

Formula: $C_{12}H_{10}$ / $C_6H_5C_6H_5$
Molecular mass: 154.2
Boiling point: 256°C
Melting point: 70°C
Relative density (water = 1): 1.04
Solubility in water, g/100ml at 20°C: 0.0004
Vapour pressure, Pa at 25°C: 1.19
Relative vapour density (air = 1): 5.3
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0
Flash point: 113°C c.c.
Auto-ignition temperature: 540°C
Explosive limits, vol% in air: 0.6 (at 111°C) - 5.8 (at 166°C)
Octanol/water partition coefficient as log Pow: 3.16/4.09

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
The substance may have effects on the liver and nervous system. This may result in impaired functions.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.2 ppm as TWA.
MAK: skin absorption (H); carcinogen category: 3

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur along the food chain, for example in plants. It is strongly advised not to let the chemical enter into the environment.

NOTES

Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xi, N; R: 36/37/38-50/53; S: (2)-23-60-61

1,2,4,5-TETRACHLOROBENZENE **ICSC: 0676 (November 2003)**

Benzene tetrachloride
s-Tetrachlorobenzene

CAS #: 95-94-3

EC Number: 202-466-2

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with oxidizing agents.	NO open flames.	Use powder, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough.	Use local exhaust.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes		Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: P2 filter respirator for harmful particles. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting.

STORAGE

Separated from strong oxidants.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,2,4,5-TETRACHLOROBENZENE **ICSC: 0676**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS CRYSTALS.

Physical dangers

Chemical dangers
Decomposes on burning. This produces toxic and corrosive fumes including hydrogen chloride. Reacts with strong oxidants.

Formula: $C_6H_2Cl_4$
Molecular mass: 215.9
Boiling point: 243-246°C
Melting point: 139-140°C
Density: 1.83 g/cm³
Solubility in water, mg/l at 25°C: 2.16
Vapour pressure, Pa at 25°C: 0.7
Relative vapour density (air = 1): 7.4
Flash point: 155°C c.c.
Octanol/water partition coefficient as log Pow: 4.9

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Effects of short-term exposure

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying or when dispersed, especially if powdered.

Effects of long-term or repeated exposure
The substance may have effects on the liver. This may result in liver impairment.

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

Health effects of exposure to the substance have not been investigated adequately.

ADDITIONAL INFORMATION

EC Classification

1,2,4-TRICHLOROBENZENE **ICSC: 1049 (November 2003)**

1,2,4-Trichlorobenzol
unsym-Trichlorobenzene

CAS #: 120-82-1
UN #: 2321
EC Number: 204-428-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder, foam, carbon dioxide.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness. Roughness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Sore throat. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. If solid: sweep spilled substance into sealable containers. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants, acids and food and feedstuffs.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,2,4-TRICHLOROBENZENE **ICSC: 1049**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID OR WHITE CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes on burning. This produces toxic fumes including hydrogen chloride. Reacts violently with oxidants.

Formula: $C_6H_3Cl_3$
Molecular mass: 181.5
Boiling point: 213°C
Melting point: 17°C
Relative density (water = 1): 1.5
Solubility in water, mg/l: 34.6
Vapour pressure, Pa at 25°C: 40
Relative vapour density (air = 1): 6.26
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.002
Flash point: 105°C c.c.
Auto-ignition temperature: 571°C
Explosive limits, vol% in air: 2.5-6.6 (at 150°C)
Octanol/water partition coefficient as log Pow: 3.98

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the liver.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as STEL.
MAK: skin absorption (H); carcinogen category: 3.
EU-OEL: 15.1 mg/m^3, 2 ppm as TWA; 37.8 mg/m^3, 5 ppm as STEL; (skin)

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

The occupational exposure limit value should not be exceeded during any part of the working exposure.
See ICSCs 0344 and 1222.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 22-38-50/53; S: (2)-23-37/39-60-61

1,2-DICHLOROBENZENE **ICSC: 1066 (November 2003)**
ortho-Dichlorobenzene

CAS #: 95-50-1
UN #: 1591
EC Number: 202-425-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Above 66°C explosive vapour/air mixtures may be formed.	NO open flames. Above 66°C use a closed system and ventilation.	Use water spray, powder, foam, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Drowsiness. Sore throat. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain. Dry skin.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Diarrhoea. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from aluminium, oxidants and food and feedstuffs.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,2-DICHLOROBENZENE **ICSC: 1066**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-YELLOW LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes on burning. This produces toxic and corrosive gases including hydrogen chloride. Reacts with aluminium and oxidants. Attacks plastics and rubber.

Formula: $C_6H_4Cl_2$
Molecular mass: 147.0
Boiling point: 180-183°C
Melting point: -17°C
Relative density (water = 1): 1.3
Solubility in water: very poor
Vapour pressure, kPa at 20°C: 0.16
Relative vapour density (air = 1): 5.1
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.006
Flash point: 66°C c.c.
Auto-ignition temperature: 648°C
Explosive limits, vol% in air: 2.2-9.2
Octanol/water partition coefficient as log Pow: 3.38

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the central nervous system and liver. Exposure could cause lowering of consciousness.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the kidneys and blood.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 25 ppm as TWA; 50 ppm as STEL; A4 (not classifiable as a human carcinogen).
MAK: 61 mg/m^3, 10 ppm; peak limitation category: II(2); skin absorption (H); pregnancy risk group: C.
EU-OEL: 122 mg/m^3, 20 ppm as TWA; 306 mg/m^3, 50 ppm as STEL; (skin)

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. It is strongly advised not to let the chemical enter into the environment.

NOTES

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 22-36/37/38-50/53; S: (2)-23-60-61

1,2-DIPHENYLHYDRAZINE **ICSC: 0263 (April 2005)**

Hydrazobenzene
Diphenylhydrazine
N,N'-Bianiline

CAS #: 122-66-7

EC Number: 204-563-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder, foam, carbon dioxide.

See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. AVOID ALL CONTACT!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Separated from food and feedstuffs. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,2-DIPHENYLHYDRAZINE **ICSC: 0263**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
WHITE-TO-YELLOW CRYSTALS.

Physical dangers

Chemical dangers
Decomposes on burning. This produces toxic fumes including nitrogen oxides. Reacts with mineral acids. This produces benzidine (see ICSC 0224).

Formula: $C_{12}H_{12}N_2$ / $C_6H_5NHNHC_6H_5$
Molecular mass: 184.3
Decomposes at 125-131°C
Density: 1.16 g/cm³
Solubility in water, g/100ml at 20°C: <0.1 (poor)
Octanol/water partition coefficient as log Pow: 2.94

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure
May cause mechanical irritation.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
This substance is probably carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

MAK: carcinogen category: 2

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

Do NOT take working clothes home.
Depending on the degree of exposure, periodic medical examination is suggested.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 45-22-50/53; S: 53-45-60-61; Note: E

1,3-DICHLOROBENZENE **ICSC: 1095 (April 2000)**

m-Dichlorobenzene
m-Phenylene dichloride

CAS #: 541-73-1
UN #: 2810
EC Number: 208-792-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 63°C explosive vapour/air mixtures may be formed.	NO open flames. Above 63°C use a closed system and ventilation.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Cough. Drowsiness. Nausea. Sore throat. Vomiting. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Diarrhoea. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from strong oxidants, aluminium and food and feedstuffs. Well closed. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,3-DICHLOROBENZENE **ICSC: 1095**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID.

Physical dangers
The vapour is heavier than air.

Chemical dangers
Decomposes on burning. This produces toxic fumes including hydrogen chloride. Reacts with strong oxidants. Reacts violently with aluminium.

Formula: $C_6H_4Cl_2$
Molecular mass: 147.00
Boiling point: 173°C
Melting point: -24.8°C
Relative density (water = 1): 1.288
Solubility in water: none
Vapour pressure, kPa at 25°C: 0.286
Relative vapour density (air = 1): 5.1
Flash point: 63°C
Octanol/water partition coefficient as log Pow: 3.53

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure
The vapour is irritating to the eyes, skin and respiratory tract. See Notes.

Inhalation risk
No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure
The substance may have effects on the kidneys and liver. See Notes.

OCCUPATIONAL EXPOSURE LIMITS

MAK: 12 mg/m^3, 2 ppm; peak limitation category: II(2); pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

Data on the toxicity of m-dichlorobenzene are limited.
See ICSCs 0037 and 1066.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 22-51/53; S: (2)-61

1,4-DICHLOROBENZENE **ICSC: 0037 (May 2018)**

p-Dichlorobenzene
PDCB

CAS #: 106-46-7
UN #: 3077
EC Number: 203-400-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 66°C explosive vapour/air mixtures may be formed. Finely dispersed particles form explosive mixtures in air.	NO open flames. Above 66°C use a closed system, ventilation and explosion-proof electrical equipment. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Drowsiness. Headache. Nausea. Shortness of breath. Vomiting.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Diarrhoea. Further see Inhalation.	Do not eat, drink, or smoke during work.	Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants and food and feedstuffs. Provision to contain effluent from fire extinguishing. Keep in a well-ventilated room. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

Harmful if swallowed
Causes serious eye irritation
Suspected of causing cancer
Very toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 9; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,4-DICHLOROBENZENE **ICSC: 0037**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-WHITE CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
On combustion, forms toxic and corrosive fumes including hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Upon heating, toxic fumes are formed. Reacts with strong oxidants. This generates fire and explosion hazard.

Formula: $C_6H_4Cl_2$
Molecular mass: 147
Boiling point: 174°C
Melting point: 53°C
Density: 1.2 g/cm³
Solubility in water, mg/l at 20°C: 49 (practically insoluble)
Vapour pressure, Pa at 20°C: 170
Relative vapour density (air = 1): 5.08
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01
Flash point: 66°C c.c.
Explosive limits, vol% in air: 1.7-5.9
Octanol/water partition coefficient as log Pow: 3.37
Auto-ignition temperature: 640°C
Viscosity: 0.73 mPa*s at 70°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, respiratory tract and skin. The substance may cause effects on the blood. This may result in haemolytic anaemia. The substance may cause effects on the central nervous system.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance may have effects on the liver, central nervous system, blood and lungs. This may result in liver function impairment, neuropathy and anaemia. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: 12 mg/m^3, 2 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.
EU-OEL: 12 mg/m^3, 2 ppm as TWA; 60 mg/m^3, 10 ppm as STEL; (skin)

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 36-40-50/53; S: (2)-36/37-46-60-61

2,3,4,6-TETRACHLOROPHENOL **ICSC: 1089 (October 2005)**

2,4,5,6-Tetrachlorophenol
Phenol, 2,3,4,6-tetrachloro-

CAS #: 58-90-2
UN #: 2020
EC Number: 200-402-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, alcohol-resistant foam, dry powder, carbon dioxide.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Cough. Shortness of breath. Convulsions.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Headache. Dizziness. Vomiting. Weakness. Convulsions. Muscle spasms. Fever. Sweating. See Notes.	Do not eat, drink, or smoke during work. Wash hands before eating.	Give a slurry of activated charcoal in water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: chemical protection suit and particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

2,3,4,6-TETRACHLOROPHENOL **ICSC: 1089**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
BROWN SOLID IN VARIOUS FORMS WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes on heating. This produces corrosive fumes including hydrogen chloride.

Formula: $C_6H_2Cl_4O$
Molecular mass: 231.9
Melting point: 70°C
Density: 1.8 g/cm³
Solubility in water, g/100ml at 20°C: 0.1 (very poor)
Flash point: 100°C
Octanol/water partition coefficient as log Pow: 4.45

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. See Notes.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
The substance may have effects on the liver. The substance may have effects on the skin. This may result in chloracne. See Notes.

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

2,3,4,6-Tetrachlorophenol is a polychlorophenol which, as a group, has been classified by IARC (1999) as possibly carcinogenic to humans, but the data on this specific substance are inconclusive.
No data are available on this isomer but a mixture of tetrachlorophenols may cause irritation of the skin, eyes and respiratory tract.
These substances may cause acute metabolic effects resulting in damage in several organs notably in central nervous system.
Some technical products may contain highly toxic impurities including polychlorinated dibenzo-p-dioxins and furans.
Depending on the degree of exposure, periodic medical examination is suggested.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 25-36/38-50/53; S: (1/2)-26-28-37-45-60-61

2,4,5-TRICHLOROPHENOL **ICSC: 0879 (April 2014)**

2,4,5-TCP
1-Hydroxy-2,4,5-trichlorobenzene

CAS #: 95-95-4
UN #: 2020
EC Number: 202-467-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames. NO contact with strong oxidizing agents.	Use foam, powder, carbon dioxide.

PREVENT DISPERSION OF DUST!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. To remove substance use polyethylene glycol 300 or vegetable oil. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Dizziness. Headache. Vomiting. Fatigue. Sweating.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants and food and feedstuffs. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

Harmful if swallowed
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation
Very toxic to aquatic life

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

2,4,5-TRICHLOROPHENOL **ICSC: 0879**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-YELLOW CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
May explode on heating to decomposition. Decomposes on heating and on contact with strong oxidants. This produces toxic and irritating fumes (chlorine, hydrochloric acid). The substance is a weak acid. Reacts in an alkaline medium at high temperatures producing highly toxic chlorinated dioxins.

Formula: $C_6H_3Cl_3O$ / $C_6H_2Cl_3(OH)$
Molecular mass: 197.5
Boiling point: 253°C
Melting point: 67°C
Density: 1.68 g/cm³
Relative vapour density (air = 1): 6.8
Solubility in water, g/l at 20°C: 1.2 (poor)
Flash point: 133°C c.c.
Vapour pressure, Pa at 25°C: 2.9
Octanol/water partition coefficient as log Pow: 3.7

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by ingestion.

Effects of short-term exposure
The substance is severely irritating to the eyes, skin and respiratory tract.

Inhalation risk
No indication can be given about the rate at which a harmful concentration of this substance in the air is reached when dispersed.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver and kidneys. See Notes.

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

The substance is very toxic to aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

Some technical products may contain highly toxic impurities including polychlorinated dibenzo-p-dioxins and furans.
Depending on the degree of exposure, periodic medical examination is suggested.
If the substance is formulated with solvent(s) also consult the card(s) (ICSC) of the solvent(s).
Carrier solvents used in commercial formulations may change physical and toxicological properties.
See ICSCs 588, 589, 590 and 1122.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 22-36/38-50/53; S: (2)-26-28-60-61

2,4,6-TRICHLOROPHENOL **ICSC: 1122 (November 2019)**
2,4,6-TCP

CAS #: 88-06-2
UN #: 2020
EC Number: 201-795-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.		Use foam, dry powder, carbon dioxide.

PREVENT DISPERSION OF DUST!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use ventilation (not if powder), local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. To remove substance use polyethylene glycol 300 or vegetable oil. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Vomiting. Burning sensation. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from strong oxidants and food and feedstuffs. Well closed. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

Harmful if swallowed
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation
Suspected of causing cancer
Very toxic to aquatic life

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

2,4,6-TRICHLOROPHENOL **ICSC: 1122**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-YELLOW CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes on heating. This produces toxic and corrosive fumes including hydrogen chloride and chlorine. Reacts with strong oxidants.

Formula: $C_6H_3Cl_3O$ / $C_6H_2Cl_3OH$
Molecular mass: 197.5
Boiling point: 246°C
Melting point: 69°C
Density (at 25°C): 1.7 g/cm³
Solubility in water, g/l at 20°C: 0.8 (very poor)
Vapour pressure, Pa at 76.5°C: 133
Flash point: 99°C c.c.
Octanol/water partition coefficient as log Pow: 3.7

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body through the skin and by ingestion.

Effects of short-term exposure
The substance is severely irritating to the eyes, skin and respiratory tract.

Inhalation risk
No indication can be given about the rate at which a harmful concentration of this substance in the air is reached when dispersed.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis including chloracne. The substance may have effects on the liver. This may result in impaired functions. This substance is possibly carcinogenic to humans. Tumours have been detected in experimental animals but may not be relevant to humans.

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

The substance is very toxic to aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

Some technical products may contain highly toxic impurities including polychlorinated dibenzo-p-dioxins and furans.
See ICSCs 0588, 0589, 0590 and 879.

ADDITIONAL INFORMATION

EC Classification
H302; H315; H319; H351; H400; H410

2,4-DICHLOROPHENOL **ICSC: 0438 (May 2010)**

2,4-DCP
2,4-Dichlorohydroxybenzene
1-Hydroxy-2,4-dichlorobenzene

CAS #: 120-83-2
UN #: 2020
EC Number: 204-429-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air.	NO open flames. Prevent build-up of electrostatic charges (e.g., by grounding).	Use water spray, foam, powder, carbon dioxide.

PREVENT DISPERSION OF DUST! PREVENT GENERATION OF MISTS! AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Cough. Burning sensation behind the breastbone. Shortness of breath. Laboured breathing. Further see Ingestion.	Use local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain. Blisters. Further see Inhalation.	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. See Notes. To remove substance use polyethylene glycol 400 or vegetable oil. Rinse skin with plenty of water or shower. Refer immediately for medical attention.
Eyes	Redness. Pain. Severe burns.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Burns in mouth and throat. Abdominal pain. Tremor. Convulsions. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing. Separated from strong oxidants and food and feedstuffs. Ventilation along the floor.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Harmful if swallowed
Toxic in contact with skin
Causes severe skin burns and eye damage
Causes damage to central nervous system
May cause damage to the respiratory system if inhaled
Toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

2,4-DICHLOROPHENOL **ICSC: 0438**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air. If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc.

Chemical dangers
Decomposes on heating. This produces toxic fumes including chlorine and hydrogen chloride. Decomposes on burning. This produces toxic fumes including phosgene and dioxins. Reacts violently with acids and strong oxidants.

Formula: $C_6H_4Cl_2O$
Molecular mass: 163.0
Boiling point: 210.0°C
Melting point: 45.0°C
Density: 1.4 g/cm³
Solubility in water, g/100ml at 20°C: 0.45 (poor)
Vapour pressure, Pa at 20°C: 10
Relative vapour density (air = 1): 5.6
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00
Flash point: 113°C o.c.
Auto-ignition temperature: 500°C
Octanol/water partition coefficient as log Pow: 3.17

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion. Serious local effects by all routes of exposure.

Effects of short-term exposure
The substance is corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. The hot liquid may cause severe skin burns. Exposure to the molten substance may result in extensive skin absorption and rapid death. Inhalation of the vapour may cause lung oedema. See Notes. Medical observation is indicated. The substance may cause effects on the central nervous system.

Inhalation risk
A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C; when in molten form, however, evaporation will be much faster.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

The substance is toxic to aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.
Isolate contaminated clothing by sealing in a bag or other container.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 22-24-34-51/53; S: (1/2)-26-36/37/39-45-61

2,4-XYLENOL **ICSC: 0458 (July 2003)**

2,4-Dimethylphenol
m-Xylenol
1-Hydroxy-2.4-dimethylbenzene

CAS #: 105-67-9
UN #: 2261
EC Number: 203-321-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder, alcohol-resistant foam, carbon dioxide.

PREVENT DISPERSION OF DUST! PREVENT GENERATION OF MISTS! STRICT HYGIENE!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Burning sensation. Cough. Sore throat. Shortness of breath. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	Redness. Pain. Skin burns.	Protective clothing. Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain. Severe burns.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Nausea. Vomiting. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. If liquid: collect leaking liquid in covered plastic containers.

STORAGE

Separated from food and feedstuffs, acid anhydrides, acid chlorides, bases and oxidants.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

2,4-XYLENOL **ICSC: 0458**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
YELLOW-TO-BROWN LIQUID OR COLOURLESS CRYSTALS.

Physical dangers

Chemical dangers
Decomposes on burning. This produces toxic gases and irritating fumes. Reacts with acid anhydrides, acid chlorides, bases and oxidants.

Formula: $C_8H_{10}O$ / $(CH_3)_2C_6H_3OH$
Molecular mass: 122.17
Boiling point: 211.5°C
Melting point: 25.4-26°C
Density: 0.97 g/cm³
Solubility in water, g/100ml at 25°C: 0.79
Vapour pressure, Pa at 20°C: 8
Flash point: >112°C c.c.
Auto-ignition temperature: 599°C
Explosive limits, vol% in air: 1.1-6.4
Octanol/water partition coefficient as log Pow: 2.3

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, by ingestion and through the skin.

Effects of short-term exposure
The substance is corrosive to the skin, respiratory tract and eyes. Corrosive on ingestion. Inhalation of the aerosol may cause lung oedema. See Notes.

Inhalation risk
No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact may cause skin sensitization.

OCCUPATIONAL EXPOSURE LIMITS

TLV: (inhalable fraction and vapour): 1 ppm as TWA; (DSEN); A3 (confirmed animal carcinogen with unknown relevance to humans)

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort.
Rest and medical observation are therefore essential.
Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 24/25-34-51/53; S: (1/2)-26-36/37/39-45-61; Note: C

2,4-DINITROPHENOL **ICSC: 0464 (June 2015)**

Phenol, 2,4-dinitro
1-Hydroxy-2,4-dinitrobenzene

CAS #: 51-28-5
UN #: 1320 (see Notes)
EC Number: 200-087-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion.	NO open flames, NO sparks and NO smoking. Do NOT expose to friction or shock. Use non-sparking handtools. Prevent deposition of dust. Closed system, dust explosion-proof electrical equipment and lighting.	Use water in large amounts. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	See Ingestion.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin	MAY BE ABSORBED! Redness. Roughness. Yellow staining of the skin. Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer immediately for medical attention .
Eyes	Yellow vision. Redness. Conjunctivitis.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Nausea. Sweating. Severe thirst. Fever. Increased heart rate. Vomiting. Shock or collapse.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rest. Refer immediately for medical attention. See Notes.

SPILLAGE DISPOSAL

Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Do not allow to dry out. Do NOT let this chemical enter the environment. Sweep spilled substance into containers. Carefully collect remainder. Store and dispose of according to local regulations.

STORAGE

Fireproof. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing. Cool. Separated from combustible substances, reducing agents and food and feedstuffs.

PACKAGING

Unbreakable packaging.
Put breakable packaging into closed unbreakable container.
Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Fatal if swallowed
Toxic in contact with skin
May cause damage to organs through prolonged or repeated exposure
Very toxic to aquatic life

Transportation
UN Classification
UN Hazard Class: 4.1; UN Subsidiary Risks: 6.1; UN Pack Group: I

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

2,4-DINITROPHENOL **ICSC: 0464**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
May decompose explosively on shock, friction or concussion. May explode on heating. Mixtures with alkalis, ammonia and most metals are shock-sensitive. Decomposes on heating. This produces toxic gases including nitrogen oxides. See Notes.

Formula: $C_6H_4N_2O_5$ / $C_6H_3(OH)(NO_2)_2$
Molecular mass: 184.11
Melting point: 112°C
Relative density (water = 1): 1.68
Solubility in water, g/l: 6 (poor)
Relative vapour density (air = 1): 6.36
Octanol/water partition coefficient as log Pow: 1.67 (estimated)

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body through the skin and by ingestion.

Effects of short-term exposure
The substance may be irritating to the eyes and skin.

Inhalation risk
A nuisance-causing concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the metabolism. This may result in cataract, cardiovascular disorders and nervous system impairment.

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

The substance is very toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

Use all available methods for reducing body temperature.
Because of its explosive properties, the compound is used in the form of a water paste.
UN 0076 applies to the dry compound or wetted with less than 15% water (Hazard class 1, Subsidiary Risks 6.1). UN 1320 applies to compound wetted with no less than 15% water
CAS 25550-58-7 applies to unspecified isomers of dinitrophenol.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 23/24/25-33-50; S: (1/2)-28-37-45-61

2,4-DINITROTOLUENE **ICSC: 0727 (April 2005)**

1-Methyl-2,4-dinitrobenzene
2,4-DNT

CAS #: 121-14-2
UN #: 3454
EC Number: 204-450-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air. Risk of explosion on contact with many substances.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Blue lips, fingernails and skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! See Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes		Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from strong bases, food and feedstuffs, oxidants and strong reducing agents. Well closed. Keep in a well-ventilated room. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

2,4-DINITROTOLUENE **ICSC: 0727**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
YELLOW CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
May explode on heating. Decomposes on heating. This produces toxic and corrosive fumes including nitrogen oxides even in the absence of air. Reacts with reducing agents, strong bases and oxidants. This generates explosion hazard.

Formula: $C_7H_6N_2O_4$ / $C_6H_3CH_3(NO_2)_2$
Molecular mass: 182.1
Decomposes at >250°C
Melting point: 71°C
Density: 1.52 g/cm³
Solubility in water: very poor
Vapour pressure, Pa at 25°C: 0.02
Relative vapour density (air = 1): 6.28
Flash point: 169°C c.c.
Octanol/water partition coefficient as log Pow: 1.98

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance may cause effects on the blood. This may result in the formation of methaemoglobin. The effects may be delayed. Medical observation is indicated.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

Effects of long-term or repeated exposure
The substance may have effects on the blood. This may result in the formation of methaemoglobin. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.
Do NOT take working clothes home.
UN number for molten form: UN1600, TEC (R) 61GT1-II.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 45-23/24/25-48/22-62-68-51/53; S: 53-45-61; Note: E

2,6-DINITROTOLUENE **ICSC: 0728 (April 2005)**

1-Methyl-2,6-dinitrobenzene
2,6-DNT

CAS #: 606-20-2
UN #: 3454
EC Number: 210-106-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air. Risk of explosion on contact with many substances.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! See Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes		Wear face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from strong bases, food and feedstuffs, oxidants and strong reducing agents. Well closed. Keep in a well-ventilated room.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

2,6-DINITROTOLUENE **ICSC: 0728**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
YELLOW OR BROWN-TO-RED CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
May explode on heating. Decomposes on heating. This produces toxic and corrosive fumes including nitrogen oxides even in the absence of air. Reacts with reducing agents, strong bases and oxidants. This generates explosion hazard.

Formula: $C_7H_6N_2O_4$ / $C_6H_3CH_3(NO_2)_2$
Molecular mass: 182.1
Decomposes at 285°C
Melting point: 66°C
Relative density (water = 1): 1.283 (liquid)
Solubility in water: very poor
Vapour pressure, Pa at 20°C: 2.4
Relative vapour density (air = 1): 6.28
Flash point: 207°C c.c.
Octanol/water partition coefficient as log Pow: 2.05

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance may cause effects on the blood. This may result in the formation of methaemoglobin. The effects may be delayed. Medical observation is indicated.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

Effects of long-term or repeated exposure
The substance may have effects on the blood. This may result in the formation of methaemoglobin. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.
Do NOT take working clothes home.
UN number for molten form: UN1600.
See ICSC 0465.

ADDITIONAL INFORMATION

EC Classification
Symbol: T; R: 45-23/24/25-48/22-62-68-52/53; S: 53-45-61; Note: E

2-Chloronaphthalene **ICSC: 1708 (March 2009)**
beta-Chloronaphthalene
bete-Naphthyl chloride

CAS #: 91-58-7
UN #: 3077
EC Number: 202-079-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use foam, dry powder, carbon dioxide.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Seek medical attention if you feel unwell.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Sore throat. Nausea.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Seek medical attention if you feel unwell.

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from strong oxidants. Store in an area without drain or sewer access.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

May be harmful if swallowed
Toxic to aquatic life

Transportation
UN Classification
UN Hazard Class: 9; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

2-Chloronaphthalene **ICSC: 1708**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
WHITE CRYSTALLINE POWDER.

Physical dangers

Chemical dangers
Decomposes on heating. This produces toxic and corrosive gases including hydrogen chloride. Reacts with strong oxidants.

Formula: $C_{10}H_7Cl$
Molecular mass: 162.6
Boiling point at 101kPa: 259°C
Melting point: 59.5°C
Density: 1.18 g/cm³
Solubility in water, g/100ml: (none)
Vapour pressure, Pa at 25°C: 1
Relative vapour density (air = 1): 5.6
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00
Flash point: 125°C
Octanol/water partition coefficient as log Pow: 4.2

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure
The substance may have effects on the liver. This may result in impaired functions.

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES

ADDITIONAL INFORMATION

EC Classification

o-CHLOROPHENOL **ICSC: 0849 (March 1999)**

2-Chlorophenol
2-Chloro-1-hydroxybenzene
2-Hydroxychlorobenzene

CAS #: 95-57-8
UN #: 2021
EC Number: 202-433-2

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 64°C explosive vapour/air mixtures may be formed.	NO open flames. Above 64°C use a closed system and ventilation.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Shortness of breath. Sore throat. See Ingestion. Symptoms may be delayed. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain. Blurred vision.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Drowsiness. Weakness. Convulsions.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: chemical protection suit and filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in covered containers as far as possible. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants and food and feedstuffs. Well closed.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

o-CHLOROPHENOL **ICSC: 0849**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air.

Chemical dangers
Decomposes on burning. This produces toxic and corrosive fumes of hydrochloric acid and chlorine. Reacts with oxidants.

Formula: C_6H_5ClO / C_6H_4ClOH
Molecular mass: 128.6
Boiling point: 175°C
Melting point: 9.3-9.8°C
Relative density (water = 1): 1.3
Solubility in water, g/100ml at 20°C: 2.85
Vapour pressure, Pa at 20°C: 230
Relative vapour density (air = 1): 4.4
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.08
Flash point: 64°C c.c.
Octanol/water partition coefficient as log Pow: 2.15

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure
The substance is severely irritating to the eyes, skin and respiratory tract. Inhalation of the aerosol may cause lung oedema. See Notes. The substance may cause effects on the central nervous system.

Inhalation risk
No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort.
Rest and medical observation are therefore essential.
Immediate administration of an appropriate spray, by a doctor or a person authorized by him/her, should be considered.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 20/21/22-51/53; S: (2)-28-61; Note: C

2-METHYLNAPHTHALENE **ICSC: 1276 (September 1997)**

beta-Methylnaphthalene

CAS #: 91-57-6

EC Number: 202-078-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	NO open flames.	Use powder, foam, carbon dioxide.

PREVENT DISPERSION OF DUST!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough.	Use local exhaust.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Rest. Refer for medical attention .

SPILLAGE DISPOSAL

Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.

STORAGE

Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

2-METHYLNAPHTHALENE **ICSC: 1276**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
CRYSTALS.

Physical dangers

Chemical dangers
Decomposes on heating. This produces acrid smoke and irritating fumes.

Formula: $C_{11}H_{10}$
Molecular mass: 142.2
Boiling point: 241°C
Melting point: 35°C
Relative density (water = 1): 1.00
Solubility in water, g/100ml at 25°C: 0.003
Vapour pressure, Pa at °C: 9
Octanol/water partition coefficient as log Pow: 3.86

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes.

Inhalation risk
No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged inhalation may cause effects on the lungs.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.5 ppm as TWA; (skin); A4 (not classifiable as a human carcinogen)

ENVIRONMENT

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

EC Classification

o-CRESOL **ICSC: 0030 (November 2008)**

2-Hydroxy-1-methylbenzene
2-Methylphenol
ortho-Hydroxytoluene
2-Cresol

CAS #: 95-48-7
UN #: 3455
EC Number: 202-423-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 81°C explosive vapour/air mixtures may be formed.	NO open flames. Above 81°C use a closed system and ventilation.	Use water spray, foam, powder, carbon dioxide.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation. Headache. Nausea. Vomiting. Shortness of breath. Laboured breathing.	Use local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain. Blisters. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer immediately for medical attention.
Eyes	Redness. Pain. Severe deep burns.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Burns in mouth and throat. Burning sensation in the throat and chest. Nausea. Vomiting. Abdominal pain. Shock or collapse.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Personal protection: chemical protection suit and filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants and food and feedstuffs. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Toxic if swallowed or in contact with skin
Causes severe skin burns and eye damage
Causes damage to central nervous system and blood
Causes damage to the nervous system and the blood through prolonged or repeated exposure
Toxic to aquatic life

Transportation
UN Classification
UN Hazard Class: 6.1; UN Subsidiary Risks: 8; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

o-CRESOL **ICSC: 0030**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS CRYSTALS WITH CHARACTERISTIC ODOUR. TURNS DARK ON EXPOSURE TO AIR AND LIGHT.

Physical dangers
No data.

Chemical dangers
Reacts violently with strong oxidants. The solution in water is a weak acid.

Formula: C_7H_8O / $CH_3C_6H_4OH$
Molecular mass: 108.1
Boiling point: 191°C
Melting point: 31°C
Density: 1.05 g/cm³
Solubility in water, g/100ml at 25°C: 2.5 (moderate)
Vapour pressure, Pa at 25°C: 33
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00
Flash point: 81°C c.c.
Auto-ignition temperature: 555°C
Explosive limits, vol% in air: 1.3-?
Octanol/water partition coefficient as log Pow: 1.95

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion. Serious local effects by all routes of exposure.

Effects of short-term exposure
The substance is corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. Inhalation may cause lung oedema, but only after initial corrosive effects on eyes and/or airways have become manifest. The substance may cause effects on the central nervous system. This may result in lowering of consciousness. The substance may cause effects on the blood. This may result in destruction of blood cells. Exposure far above the OEL could cause death. Medical observation is indicated.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the nervous system. This may result in impaired functions. The substance may have effects on the blood. This may result in anaemia.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 20 mg/m^3, as TWA; (skin); A4 (not classifiable as a human carcinogen).
EU-OEL: 22 mg/m^3, 5 ppm as TWA.
MAK: 4,5 mg/m^3, 1 ppm; skin absorption (H); pregnancy risk group: C; peak limitation category: I(1)

ENVIRONMENT

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

ADDITIONAL INFORMATION

EC Classification
Symbol: T, C; R: 24/25-34; S: (1/2)-36/37/39-45; Note: C

2-NITROANILINE **ICSC: 0306 (December 2001)**

o-Nitroaniline
1-Amino-2-nitrobenzene
C.I. 37025

CAS #: 88-74-4
UN #: 1661
EC Number: 201-855-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Many reactions may cause fire or explosion. Finely dispersed particles form explosive mixtures in air.	NO open flames. NO contact with combustible substances. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

PREVENT DISPERSION OF DUST!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Laboured breathing. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes		Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder.

STORAGE

Separated from strong acids, strong oxidants, combustible substances, reducing agents and food and feedstuffs.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

2-NITROANILINE **ICSC: 0306**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
ORANGE-YELLOW CRYSTALS.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
On combustion, forms toxic fumes of nitrogen oxides. Reacts with strong acids, strong oxidants and strong reducing agents. Reacts with organic materials in the presence of moisture. This generates fire hazard.

Formula: $C_6H_6N_2O_2$
Molecular mass: 138.1
Boiling point: 284°C
Melting point: 71°C
Density: 1.44 g/cm³
Solubility in water, g/100ml at 25°C: 0.126
Vapour pressure, Pa at 20°C: 4
Flash point: 168°C
Auto-ignition temperature: 521°C
Octanol/water partition coefficient as log Pow: 1.44

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure
The substance may cause effects on the blood. This may result in the formation of methaemoglobin. The effects may be delayed. Medical observation is indicated. See Notes.

Inhalation risk
No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure
The substance may have effects on the blood. This may result in the formation of methaemoglobin. See Notes.

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. See ICSCs 0307 and 0308.

ADDITIONAL INFORMATION

EC Classification
Symbol: T; R: 23/24/25-33-52/53; S: (1/2)-28-36/37-45-61; Note: C

2-NITROPHENOL **ICSC: 0523 (October 2005)**

o-Nitrophenol
2-Hydroxynitrobenzene
o-Hydroxynitrobenzene

CAS #: 88-75-5
UN #: 1663
EC Number: 201-857-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use dry powder, carbon dioxide, water spray, alcohol-resistant foam.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Headache. Drowsiness. Nausea. Blue lips, fingernails and skin. Confusion. Convulsions. Dizziness. Unconsciousness.	Do not eat, drink, or smoke during work.	Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers.

STORAGE

Store in an area without drain or sewer access. Separated from strong oxidants, strong bases, strong acids and food and feedstuffs.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

2-NITROPHENOL **ICSC: 0523**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
YELLOW CRYSTALS.

Physical dangers

Chemical dangers
Decomposes on burning. This produces toxic and corrosive fumes including nitrogen oxides. Reacts with strong acids, strong bases and strong oxidants.

Formula: $C_6H_5NO_3$
Molecular mass: 139.1
Boiling point: 216°C
Melting point: 45-46°C
Density: 1.49 g/cm³
Solubility in water, g/100ml at 20°C: 0.21 (poor)
Vapour pressure, kPa at 25°C: 0.015
Flash point: 108°C c.c.
Auto-ignition temperature: 550°C
Octanol/water partition coefficient as log Pow: 1.79

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by ingestion.

Effects of short-term exposure
The substance is mildly irritating to the eyes and skin. Ingestion could cause effects on the blood. This may result in the formation of methaemoglobin.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.

ADDITIONAL INFORMATION

EC Classification

3,3'-DICHLOROBENZIDINE **ICSC: 0481 (May 2010)**

3,3'-Dichlorobiphenyl-4,4'-ylenediamine
4,4'-Diamino-3,3'-dichlorobiphenyl

CAS #: 91-94-1

EC Number: 202-109-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use fine water spray, dry powder, carbon dioxide.

See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. PREVENT DISPERSION OF DUST! STRICT HYGIENE!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Avoid inhalation of dust. Use local exhaust or breathing protection.	Fresh air, rest. Seek medical attention if you feel unwell.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Seek medical attention if you feel unwell.
Eyes		Wear face shield or eye protection in combination with breathing protection if powder.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs. Well closed. Store only in original container. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Suspected of causing genetic defects
May cause cancer
May cause respiratory irritation
May cause damage to liver through prolonged or repeated exposure if swallowed
Toxic to aquatic life with long lasting effects

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

3,3'-DICHLOROBENZIDINE **ICSC: 0481**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
GREY-TO-PURPLE CRYSTALS.

Physical dangers
No data.

Chemical dangers
Decomposes on burning. This produces toxic and corrosive fumes including nitrogen oxides and hydrogen chloride.

Formula: $C_6H_3ClNH_2C_6H_3ClNH_2/C_{12}H_{10}Cl_2N_2$
Molecular mass: 253.1
Boiling point: 368°C
Melting point: 132-133°C
Solubility in water: none
Auto-ignition temperature: 350°C
Octanol/water partition coefficient as log Pow: 3.51

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the respiratory tract.

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed, especially if powdered.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver. This substance is probably carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: skin absorption (H); carcinogen category: 2

ENVIRONMENT

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES

The substance is combustible but no flash point is available in literature.
TLV Note: Exposure by all routes should be carefully controlled to levels as low as possible.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 45-21-43-50/53; S: 53-45-60-61; Note: E

m-CRESOL **ICSC: 0646 (November 2008)**

3-Cresol
3-Methylphenol
3-Hydroxytoluene
1-Hydroxy-3-methylbenzene

CAS #: 108-39-4
UN #: 2076
EC Number: 203-577-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 86°C explosive vapour/air mixtures may be formed.	NO open flames. Above 86°C use a closed system and ventilation.	Use water spray, foam, powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

STRICT HYGIENE! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Cough. Sore throat. Burning sensation. Headache. Nausea. Vomiting. Shortness of breath. Laboured breathing.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain. Blisters. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer immediately for medical attention.
Eyes	Redness. Pain. Severe deep burns.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Burns in mouth and throat. Burning sensation in the throat and chest. Nausea. Vomiting. Abdominal pain. Shock or collapse.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Personal protection: chemical protection suit and filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.

STORAGE

Separated from strong oxidants and food and feedstuffs. Ventilation along the floor. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Toxic if swallowed
Harmful in contact with skin
Fatal if inhaled
Causes severe skin burns and eye damage
Causes damage to central nervous system and blood if blood
Causes damage to the nervous system and the blood through prolonged or repeated exposure if the blood
Toxic to aquatic life

Transportation
UN Classification
UN Hazard Class: 6.1; UN Subsidiary Risks: 8; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

m-CRESOL **ICSC: 0646**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-YELLOW LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Reacts violently with strong oxidants. The solution in water is a weak acid.

Formula: C_7H_8O / $CH_3C_6H_4OH$
Molecular mass: 108.1
Boiling point: 202°C
Melting point: 11-12°C
Relative density (water = 1): 1.03
Solubility in water, g/100ml at 20°C: 2.4 (moderate)
Vapour pressure, Pa at 20°C: 13
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0
Flash point: 86°C
Auto-ignition temperature: 575°C
Explosive limits, vol% in air: 1.0-?
Octanol/water partition coefficient as log Pow: 1.96
Viscosity: 4.05 mm²/s at 50°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion. Serious local effects by all routes of exposure.

Effects of short-term exposure
The substance is corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. Inhalation may cause lung oedema, but only after initial corrosive effects on eyes and/or airways have become manifest. The substance may cause effects on the central nervous system. This may result in lowering of consciousness. The substance may cause effects on the blood. This may result in destruction of blood cells. Exposure far above the OEL could cause death. Medical observation is indicated.

Inhalation risk
A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the nervous system. This may result in impaired functions. The substance may have effects on the blood. This may result in anaemia.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 20 mg/m^3, as TWA; (skin); A4 (not classifiable as a human carcinogen).
EU-OEL: 22 mg/m^3, 5 ppm as TWA.
MAK: 4,5 mg/m^3, 1 ppm; skin absorption (H); peak limitation category: I(1); pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

ADDITIONAL INFORMATION

EC Classification
Symbol: T, C; R: 24/25-34; S: (1/2)-36/37/39-45; Note: C

3-NITROANILINE **ICSC: 0307 (December 2001)**

m-Nitroaniline
1-Amino-3-nitrobenzene
C.I. 37030

CAS #: 99-09-2
UN #: 1661
EC Number: 202-729-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Many reactions may cause fire or explosion. Finely dispersed particles form explosive mixtures in air.	NO open flames. NO contact with combustible substances. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

PREVENT DISPERSION OF DUST!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Laboured breathing. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes		Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder.

STORAGE

Separated from strong acids, strong oxidants, combustible substances, reducing agents and food and feedstuffs. Dry.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

3-NITROANILINE **ICSC: 0307**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
YELLOW CRYSTALS.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
On combustion, forms toxic fumes of nitrogen oxides. Reacts with strong acids, strong oxidants and strong reducing agents. Reacts with organic materials in the presence of moisture. This generates fire hazard.

Formula: $C_6H_6N_2O_2$
Molecular mass: 138.1
Decomposes at 306°C
Melting point: 114°C
Density: 1.4 g/cm³
Solubility in water, g/100ml at 25°C: 0.089
Vapour pressure, Pa at 25°C: 0.005
Octanol/water partition coefficient as log Pow: 1.37

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure
The substance may cause effects on the blood. This may result in the formation of methaemoglobin. Medical observation is indicated. The effects may be delayed. See Notes.

Inhalation risk
No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure
The substance may have effects on the blood. This may result in the formation of methaemoglobin. See Notes.

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.
See ICSCs 0306 and 0308.

ADDITIONAL INFORMATION

EC Classification
Symbol: T; R: 23/24/25-33-52/53; S: (1/2)-28-36/37-45-61; Note: C

DINITRO-o-CRESOL **ICSC: 0462 (April 2004)**

4,6-Dinitro-ortho-cresol
2-Methyl-4,6-dinitrophenol
DNOC
2,4-Dinitro-ortho-cresol

CAS #: 534-52-1
UN #: 1598
EC Number: 208-601-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air. Risk of fire and explosion on contact with oxidizing agents.	NO open flames. NO contact with oxidizing agents. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, foam, dry powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sweating. Fever. Nausea. Shortness of breath. Laboured breathing. Headache. Convulsions. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Yellow staining of the skin. Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Vomiting. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants and food and feedstuffs. Well closed.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

DINITRO-o-CRESOL **ICSC: 0462**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
ODOURLESS YELLOW CRYSTALS.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
Decomposes on burning. This produces toxic fumes including nitrogen oxides. Reacts violently with strong oxidants.

Formula: $C_7H_6N_2O_5$ / $CH_3C_6H_2OH(NO_2)_2$
Molecular mass: 198.1
Boiling point: 312°C
Melting point: 87.5°C
Density: 1.58 g/cm³
Solubility in water, g/100ml at 20°C: 0.694
Vapour pressure, Pa at 25°C: 0.016
Relative vapour density (air = 1): 6.8
Auto-ignition temperature: 340°C
Octanol/water partition coefficient as log Pow: 2.56

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is corrosive to the eyes. The substance is irritating to the skin. The substance may cause effects on the metabolic rate. Exposure at high levels could cause death.

Inhalation risk
A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

TLV: (inhalable fraction and vapour): 0.2 mg/m^3, as TWA; (skin).
MAK: (vapour and aerosol): skin absorption (H)

ENVIRONMENT

The substance is very toxic to aquatic organisms.

NOTES

Do NOT take working clothes home.
Technical grade may cause skin sensitization.

ADDITIONAL INFORMATION

EC Classification
Symbol: T+, N; R: 26/27/28-38-41-43-44-50/53-68; S: (1/2)-36/37-45-60-61

TCI AMERICA

SAFETY DATA SHEET

Revision number: 2
Revision date: 10/06/2014

1. IDENTIFICATION

Product name: 4-Bromodiphenyl Ether
Product code: B0637

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborgate Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

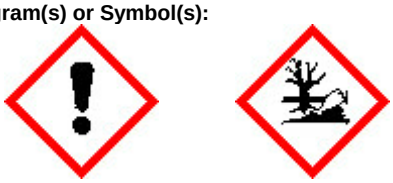
2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:
Skin Corrosion/Irritation [Category 2]
Eye Damage/Irritation [Category 2A]
Aquatic Hazard (Acute) [Category 1]
Aquatic Hazard (Long-Term) [Category 1]

Signal word: Warning!

Hazard Statement(s):
Causes serious eye irritation
Causes skin irritation
Very toxic to aquatic life
Very toxic to aquatic life with long lasting effects

Pictogram(s) or Symbol(s):



Precautionary Statement(s):

[Prevention] Wash hands and face thoroughly after handling. Wear protective gloves. Wear eye and face protection.
[Response] If on skin: Wash with plenty of water. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention.
[Storage] None
[Disposal] None

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance
Components: 4-Bromodiphenyl Ether
Percent: >98.0%(GC)

3. COMPOSITION/INFORMATION ON INGREDIENTS

CAS Number: 101-55-3
Molecular Weight: 249.11
Chemical Formula: $C_{12}H_9BrO$
Synonyms: 4-Bromophenyl Phenyl Ether

4. FIRST-AID MEASURES

Inhalation: Call emergency medical service. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact: Call a poison center or doctor if you feel unwell. Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Eye contact: IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Contact with material may irritate or burn eyes. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Do not induce vomiting with out medical advice. If swallowed, seek medical advice immediately and show the container or label. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: Redness.
Delayed: No data available

Immediate medical attention: If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO_2 , sand, earth, water spray or regular foam Consult with local fire authorities before attempting large scale fire fighting operations.

Specific hazards arising from the chemical
Hazardous combustion products: These products include: Carbon oxides Halogenated compounds
Other specific hazards: Closed containers may explode from heat of a fire.

Special precautions for fire-fighters:
Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.
Special protective equipment for fire-fighters:
Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

Emergency procedures: In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

6. ACCIDENTAL RELEASE MEASURES

Methods and materials for containment and cleaning up:
ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material. Ventilate the area.
Environmental precautions:
Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Do NOT breath gas, fumes, vapor, or spray. Avoid contact with skin and eyes. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Keep only in the original container in a cool well-ventilated place. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Combustible substances, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

Appropriate engineering controls:
Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection: Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection: Wear protective gloves.
Eye protection: Splash goggles.
Skin and body protection: Lab coat.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid
Form: Clear
Color: Colorless - Very pale yellow
Odor: No data available
Odor threshold: No data available

Melting point/freezing point:	18°C (Freezing point) (64°F)	**pH:**	No data available
Boiling point/range:	305°C (581°F)	**Vapor pressure:**	No data available
Decomposition temperature:	No data available	**Vapor density:**	No data available
Relative density:	1.43	**Dynamic Viscosity:**	No data available
Kinematic Viscosity:	No data available		
Partition coefficient: n-octanol/water (log P_{ow})	No data available	**Evaporation rate:** (Butyl Acetate = 1)	No data available
Flash point:	110°C (230°F)	**Autoignition temperature:**	No data available
Flammability (solid, gas):	No data available	**Flammability or explosive limits:**	
		Lower:	No data available
		Upper:	No data available

Solubility(ies):

10. STABILITY AND REACTIVITY

Reactivity: Not Available.
Chemical Stability: Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions: No hazardous reactivity has been reported.
Conditions to avoid: Avoid excessive heat and light.
Incompatible materials: Strong oxidizing agents
Hazardous Decomposition Products: No data available

11. TOXICOLOGICAL INFORMATION

Acute Toxicity:
No data available

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
No data available

Carcinogenicity:

No data available

IARC: No data available **NTP:** No data available **OSHA:** No data available

Reproductive toxicity:
No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.
Symptoms related to exposure:
Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Skin contact may result in redness, pain or dry skin. Eye contact may result in redness or pain.
Potential Health Effects:
Skin and eye contact may result in irritation.
Target organ(s): No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity

Fish:	No data available
Crustacea:	No data available
Algae:	No data available

Persistence and degradability:	No data available
Bioaccumulative potential (BCF):	No data available
Mobillity in soil:	No data available
Partition coefficient: n-octanol/water (log P_{ow})	No data available
Soil adsorption (Koc):	No data available
Henry's Law: constant (PaM^3/mol)	No data available

13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.
Disposal of container: Dispose of as unused product. Do not re-use empty containers.
Other considerations: Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US) Non-hazardous for transportation.

14. TRANSPORT INFORMATION

IATA Non-hazardous for transportation.

IMDG Non-hazardous for transportation.

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):
This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313:	Not Listed
SARA 302:	Not Listed

State Regulations

State Right-to-Know

Massachusetts	Not Listed
New Jersey	Listed
Pennsylvania	Not Listed
California Proposition 65:	Not Listed

Other Information

NFPA Rating:

Health:	2
Flammability:	1
Instability:	0

HMIS Classification:

Health:	2
Flammability:	1
Physical:	0

International Inventories

WHMIS hazard class:	D2B: Materials causing other toxic effects. (Toxic)
EC-No:	202-952-4

16. OTHER INFORMATION

Revision date: 10/06/2014
Revision number: 2
TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

4-CHLORO-m-CRESOL **ICSC: 0131 (June 1997)**

p-Chloro-m-cresol
2-Chloro-5-hydroxytoluene
4-Chloro-3-methylphenol

CAS #: 59-50-7
UN #: 2669
EC Number: 200-431-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Cough. Sore throat. See Ingestion.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain. Severe deep burns.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Headache. Dizziness. Shortness of breath. Abdominal pain. Vomiting. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Then store and dispose of according to local regulations.	**According to UN GHS Criteria** **Transportation** **UN Classification** UN Hazard Class: 6.1; UN Pack Group: II
STORAGE	
Separated from food and feedstuffs. Dry.	
PACKAGING	

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

4-CHLORO-m-CRESOL **ICSC: 0131**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
WHITE OR SLIGHTLY PINK HYGROSCOPIC CRYSTALS OR CRYSTALLINE POWDER.

Physical dangers

Chemical dangers
Decomposes on burning. This produces toxic and corrosive fumes including hydrogen chloride and phosgene.

Formula: C_7H_7ClO / $C_6H_3OHCH_3Cl$
Molecular mass: 142.58
Boiling point: 235°C
Melting point: 66°C
Density: 1.4 g/cm³
Solubility in water, g/100ml at 20°C: 0.38
Flash point: 118°C
Auto-ignition temperature: 590°C
Octanol/water partition coefficient as log Pow: 3.1

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract.

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure
Repeated or prolonged contact may cause skin sensitization.

OCCUPATIONAL EXPOSURE LIMITS

MAK sensitization of skin (SH)

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 21/22-41-43-50; S: (2)-26-36/37/39-61

4-CHLOROANILINE **ICSC: 0026 (October 2001)**

Chloroaminobenzene, p-
Chloroaniline, p-

CAS #: 106-47-8
UN #: 2018
EC Number: 203-401-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder, foam, carbon dioxide.

PREVENT DISPERSION OF DUST! STRICT HYGIENE! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Blue lips, fingernails and skin. Confusion. Convulsions. Dizziness. Headache. Nausea. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: P3 filter respirator for toxic particles and chemical protection suit. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants and food and feedstuffs.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

4-CHLOROANILINE **ICSC: 0026**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-YELLOW CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes on burning. This produces toxic and corrosive fumes including hydrogen chloride and nitrogen oxides. Reacts violently with oxidants.

Formula: C_6H_6ClN / $ClC_6H_4NH_2$
Molecular mass: 127.6
Boiling point: 232°C
Melting point: 69-72.5°C
Relative density (water = 1): 1.4
Solubility in water, g/100ml at 20°C: 0.39
Vapour pressure, Pa at 20°C: 2
Relative vapour density (air = 1): 4.4
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00
Flash point: 120-123°C o.c.
Auto-ignition temperature: 685°C
Octanol/water partition coefficient as log Pow: 1.8

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes. The substance may cause effects on the red blood cells. This may result in lesions of blood cells and the formation of methaemoglobin. Medical observation is indicated. The effects may be delayed.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
Repeated or prolonged contact may cause skin sensitization. The substance may have effects on the spleen. Tumours have been detected in experimental animals but may not be relevant to humans. See Notes.

OCCUPATIONAL EXPOSURE LIMITS

MAK: skin absorption (H); sensitization of skin (SH); carcinogen category: 2

ENVIRONMENT

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 45-23/24/25-43-50/53; S: 53-45-60-61; Note: E

4-Chlorodiphenyl ether

Safety Data Sheet 26075X4

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 11/27/2017 Version: 1.0

SECTION 1: Identification

1.1. Identification

Product form	:	Substance
Substance name	:	4-Chlorodiphenyl ether
CAS No	:	7005-72-3
Product code	:	2607-5-X4
Formula	:	C12H9ClO
Synonyms	:	1-Chloro-4-phenoxybenzene
Other means of identification	:	MFCD00055431

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	:	Laboratory chemicals Manufacture of substances Scientific research and development

1.3. Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.
P.O. Box 309
Alachua, FL 32615 - United States of America
T (386) 462-0788 - F (386) 462-7097
info@synquestlabs.com - www.synquestlabs.com

1.4. Emergency telephone number

Emergency number	:	(844) 523-4086 (3E Company - Account 10069)

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Skin Irrit. 2 H315 - Causes skin irritation
Eye Irrit. 2A H319 - Causes serious eye irritation
STOT SE 3 H335 - May cause respiratory irritation

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :

GHS07

Signal word (GHS-US) : Warning

Hazard statements (GHS-US) :
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H335 - May cause respiratory irritation

Precautionary statements (GHS-US) :
P261 - Avoid breathing fumes, mist, spray, vapors
P264 - Wash skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302+P352 - If on skin: Wash with plenty of soap and water
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P312 - Call a POISON CENTER or doctor/physician if you feel unwell
P321 - Specific treatment (see supplemental first aid instructions on this label)
P332+P313 - If skin irritation occurs: Get medical advice/attention
P337+P313 - If eye irritation persists: Get medical advice/attention
P362+P364 - Take off contaminated clothing and wash it before reuse
P403+P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P501 - Dispose of contents/container to an approved waste disposal plant

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	Classification (GHS-US)
4-Chlorodiphenyl ether (Main constituent)	(CAS No) 7005-72-3	<= 100	Skin Irrit. 2, H315 Eye Irrit. 2A, H319 STOT SE 3, H335

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Move the affected personnel away from the contaminated area.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Get medical advice/attention.

First-aid measures after skin contact : Wash with plenty of soap and water. Get medical advice/attention.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice/attention.

First-aid measures after ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth out with water. Get medical advice/attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Alcohol resistant foam. Carbon dioxide. Dry powder. Water spray. Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Thermal decomposition generates: Carbon oxides. Hydrogen chloride.

Explosion hazard : Risk of explosion if heated under confinement. Use water spray or fog for cooling exposed containers.

5.3. Advice for firefighters

Firefighting instructions : In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion.

Protection during firefighting : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. For further information refer to section 8: "Exposure controls/personal protection".

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe gas, fumes, vapor or spray.

6.1.1. For non-emergency personnel

Emergency procedures : Only qualified personnel equipped with suitable protective equipment may intervene.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

Emergency procedures : Gas/vapor heavier than air. May accumulate in confined spaces, particularly at or below ground level.

6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment	:	Stop leak if safe to do so. Dike for recovery or absorb with appropriate material.
Methods for cleaning up	:	Take up large spills with pump or vacuum and finish with dry chemical absorbent. Use explosion-proof equipment. Take up small spills with dry chemical absorbent. Sweep or shovel spills into appropriate container for disposal. Ventilate area.
Other information	:	For disposal of solid materials or residues refer to section 13 : "Disposal considerations".

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Do not handle until all safety precautions have been read and understood. Ensure good ventilation of the work station. Do not breathe fumes, mist, spray, vapors. Wear personal protective equipment. Avoid contact with skin and eyes.
Hygiene measures	:	Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures	:	Comply with applicable regulations.
Storage conditions	:	Keep container closed when not in use.
Incompatible materials	:	Refer to Section 10 on Incompatible Materials.
Storage area	:	Store in dry, cool, well-ventilated area.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Exposure controls

Appropriate engineering controls	:	Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Hand protection	:	Protective gloves. 29 CFR 1910.138: Hand Protection.
Eye protection	:	Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.
Skin and body protection	:	Wear suitable protective clothing.
Respiratory protection	:	In case of inadequate ventilation wear respiratory protection. 29 CFR 1910.134: Respiratory Protection.
Other information	:	Safety shoes. 29 CFR 1910.136: Foot Protection.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Liquid
Color	:	No data available
Odor	:	No data available
Odor threshold	:	No data available
pH	:	No data available
Melting point	:	-8 °C
Freezing point	:	No data available
Boiling point	:	161 - 162 °C (@ 19 mm Hg)
Flash point	:	> 110 °C
Relative evaporation rate (butyl acetate=1)	:	No data available
Flammability (solid, gas)	:	No data available
Explosion limits	:	No data available
Explosive properties	:	No data available
Oxidizing properties	:	No data available
Vapor pressure	:	No data available

Relative density	:	No data available
Relative vapor density at 20 °C	:	No data available
Specific gravity / density	:	1.193 g/ml (@ 20 °C)
Molecular mass	:	204.652 g/mol
Solubility	:	No data available
Log Pow	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available

9.2. Other information

Refractive index : 1.587 (@ 20 °C)

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

The product is stable at normal handling and storage conditions.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

Keep away from heat, sparks and flame.

10.5. Incompatible materials

Strong acids. Strong bases. Strong oxidizing agents.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	:	Not classified
Skin corrosion/irritation	:	Causes skin irritation.
Serious eye damage/irritation	:	Causes serious eye irritation.
Respiratory or skin sensitization	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified
Specific target organ toxicity (single exposure)	:	May cause respiratory irritation.
Specific target organ toxicity (repeated exposure)	:	Not classified
Aspiration hazard	:	Not classified

SECTION 12: Ecological information

12.1. Toxicity

No additional information available

12.2. Persistence and degradability

No additional information available

12.3. Bioaccumulative potential

No additional information available

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber.

Waste disposal recommendations : Dispose of contents/container in accordance with licensed collector's sorting instructions.

Additional information : Recycle the material as far as possible.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN3082 Environmentally hazardous substances, liquid, n.o.s., 9, III

UN-No.(DOT) : UN3082

Proper Shipping Name (DOT) : Environmentally hazardous substances, liquid, n.o.s.

Transport hazard class(es) (DOT) : 9 - Class 9 - Miscellaneous hazardous material 49 CFR 173.140

Hazard labels (DOT) : 9 - Class 9 (Miscellaneous dangerous materials)

Packing group (DOT) : III - Minor Danger

DOT Packaging Non Bulk (49 CFR 173.xxx) : 203

DOT Packaging Bulk (49 CFR 173.xxx) : 241

DOT Symbols : G - Identifies PSN requiring a technical name

DOT Special Provisions (49 CFR 172.102) : 8 - A hazardous substance that is not a hazardous waste may be shipped under the shipping description "Other regulated substances, liquid or solid, n.o.s.", as appropriate. In addition, for solid materials, special provision B54 applies.
146 - This description may be used for a material that poses a hazard to the environment but does not meet the definition for a hazardous waste or a hazardous substance, as defined in 171.8 of this subchapter, or any hazard class as defined in Part 173 of this subchapter, if it is designated as environmentally hazardous by the Competent Authority of the country of origin, transit or destination.
173 - An appropriate generic entry may be used for this material.
335 - Mixtures of solids that are not subject to this subchapter and environmentally hazardous liquids or solids may be classified as "Environmentally hazardous substances, solid, n.o.s," UN3077 and may be transported under this entry, provided there is no free liquid visible at the time the material is loaded or at the time the packaging or transport unit is closed. Each transport unit must be leak-proof when used as bulk packaging.
IB3 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1 and 31HA2, 31HB2, 31HN2, 31HD2 and 31HH2). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized, except for UN2672 (also see Special Provision IP8 in Table 2 for UN2672).
T4 - 2.65 178.274(d)(2) Normal..... 178.275(d)(3)
TP1 - The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = 97 / 1 + a (tr - tf) Where: tr is the maximum mean bulk temperature during transport, and tf is the temperature in degrees celsius of the liquid during filling.
TP29 - A portable tank having a minimum test pressure of 1.5 bar (150.0 kPa) may be used provided the calculated test pressure is 1.5 bar or less based on the MAWP of the hazardous materials, as defined in 178.275 of this subchapter, where the test pressure is 1.5 times the MAWP.

DOT Packaging Exceptions (49 CFR 173.xxx) : 155

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : No limit

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	:	No limit
DOT Vessel Stowage Location	:	A - The material may be stowed ‘‘on deck’’ or ‘‘under deck’’ on a cargo vessel and on a passenger vessel.
Other information	:	No supplementary information available.

TDG

No additional information available

Transport by sea

UN-No. (IMDG)	:	3082
Proper Shipping Name (IMDG)	:	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
Class (IMDG)	:	9 - Miscellaneous dangerous compounds
Packing group (IMDG)	:	III - substances presenting low danger

Air transport

UN-No. (IATA)	:	3082
Proper Shipping Name (IATA)	:	Environmentally hazardous substance, liquid, n.o.s.
Class (IATA)	:	9 - Miscellaneous Dangerous Goods
Packing group (IATA)	:	III - Minor Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory except for:

4-Chlorodiphenyl ether	CAS No 7005-72-3	100%

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

CANADA

No additional information available

EU-Regulations

No additional information available

National regulations

No additional information available

15.3. US State regulations

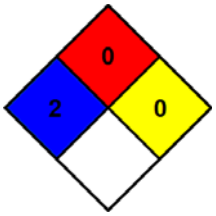
California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

SECTION 16: Other information

Full text of H-phrases:

Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation

NFPA health hazard	:	2 - Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical attention is given.
NFPA fire hazard	:	0 - Materials that will not burn.
NFPA reactivity	:	0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health	:	2 Moderate Hazard - Temporary or minor injury may occur
Flammability	:	0 Minimal Hazard - Materials that will not burn
Physical	:	0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable or any damage resulting from handling or from contact with the above product.

p-CRESOL **ICSC: 0031 (November 2008)**

4-Hydroxy-1-methylbenzene
4-Methylphenol
para-Hydroxytoluene
4-Cresol

CAS #: 106-44-5
UN #: 3455
EC Number: 203-398-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 86°C explosive vapour/air mixtures may be formed.	NO open flames. Above 86°C use a closed system and ventilation.	Use water spray, foam, powder, carbon dioxide.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation. Headache. Nausea. Vomiting. Shortness of breath. Laboured breathing.	Use local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain. Blisters. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer immediately for medical attention.
Eyes	Redness. Pain. Severe burns.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Burns in mouth and throat. Burning sensation in the throat and chest. Nausea. Vomiting. Abdominal pain. Shock or collapse.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance and chemical protection suit. Sweep spilled substance into containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.

STORAGE

Separated from strong oxidants and food and feedstuffs. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Toxic if swallowed or in contact with skin
Fatal if inhaled
Causes severe skin burns and eye damage
Causes damage to central nervous system and blood
Causes damage to the nervous system and the blood through prolonged or repeated exposure
Toxic to aquatic life

Transportation
UN Classification
UN Hazard Class: 6.1; UN Subsidiary Risks: 8; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

p-CRESOL **ICSC: 0031**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS CRYSTALS WITH CHARACTERISTIC ODOUR. TURNS DARK ON EXPOSURE TO AIR AND LIGHT.

Physical dangers

Chemical dangers
Reacts violently with strong oxidants. The solution in water is a weak acid.

Formula: C_7H_8O / $CH_3C_6H_4OH$
Molecular mass: 108.1
Boiling point: 202°C
Melting point: 35°C
Density: 1.02 g/cm³
Solubility in water, g/100ml at 25°C: 1.9 (moderate)
Vapour pressure, Pa at 25°C: 15
Relative vapour density (air = 1): 1.00
Flash point: 86°C c.c.
Auto-ignition temperature: 555°C
Explosive limits, vol% in air: 1.0-?
Octanol/water partition coefficient as log Pow: 1.94

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion. Serious local effects by all routes of exposure.

Effects of short-term exposure
The substance is corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. Inhalation may cause lung oedema, but only after initial corrosive effects on eyes and/or airways have become manifest. The substance may cause effects on the central nervous system. This may result in lowering of consciousness. The substance may cause effects on the blood. This may result in destruction of blood cells. Exposure far above the OEL could cause death. Medical observation is indicated.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the nervous system. This may result in impaired functions. The substance may have effects on the blood. This may result in anaemia.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 20 mg/m^3, as TWA; (skin); A4 (not classifiable as a human carcinogen).
EU-OEL: 22 mg/m^3, 5 ppm as TWA.
MAK: 4,5 mg/m^3, 1 ppm; skin absorption (H); peak limitation category: I(1); pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

ADDITIONAL INFORMATION

EC Classification
Symbol: T, C; R: 24/25-34; S: (1/2)-36/37/39-45; Note: C

4-NITROANILINE **ICSC: 0308 (December 2001)**

p-Nitroaniline
1-Amino-4-nitrobenzene
C.I. 37035

CAS #: 100-01-6
UN #: 1661
EC Number: 202-810-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Many reactions may cause fire or explosion. Finely dispersed particles form explosive mixtures in air.	NO open flames. NO contact with combustible substances. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Blue lips, fingernails and skin. Headache. Dizziness. Nausea. Confusion. Convulsions. Laboured breathing. Unconsciousness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Wash away remainder with plenty of water.

STORAGE

Separated from strong acids, strong oxidants, combustible substances, reducing agents and food and feedstuffs. Dry.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

4-NITROANILINE **ICSC: 0308**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
YELLOW CRYSTALS OR POWDER.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
May explode on heating. On combustion, forms toxic fumes of nitrogen oxides. Reacts with strong acids, strong oxidants and strong reducing agents. Reacts with organic materials in the presence of moisture. This generates fire hazard.

Formula: $C_6H_6N_2O_2$
Molecular mass: 138.1
Boiling point: 332°C
Melting point: 148°C
Density: 1.4 g/cm³
Solubility in water, g/100ml at 18.5°C: 0.08
Vapour pressure, Pa at 20°C: 0.2
Relative vapour density (air = 1): 4.8
Flash point: 199°C
Octanol/water partition coefficient as log Pow: 2.66

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure
The substance is mildly irritating to the eyes. The substance may cause effects on the blood. This may result in the formation of methaemoglobin. The effects may be delayed. Medical observation is indicated. See Notes.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C , on spraying or dispersing much faster.

Effects of long-term or repeated exposure
The substance may have effects on the blood. This may result in the formation of methaemoglobin. See Notes.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 3 mg/m^3, as TWA; (skin); A4 (not classifiable as a human carcinogen); BEI issued.
MAK: skin absorption (H); carcinogen category: 3

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.
See ICSCs 0306 and 0307.

ADDITIONAL INFORMATION

EC Classification
Symbol: T; R: 23/24/25-33-52/53; S: (1/2)-28-36/37-45-61; Note: C

p-NITROPHENOL **ICSC: 0066 (November 1998)**

4-Nitrophenol
4-Hydroxynitrobenzene

CAS #: 100-02-7
UN #: 1663
EC Number: 202-811-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Cough. Burning sensation. Confusion. Convulsions. Dizziness. Headache. Nausea. Sore throat. Unconsciousness. Weakness.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness. Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety spectacles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Sore throat. Vomiting. See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Rest. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Separated from combustible substances, reducing agents and food and feedstuffs. Well closed.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

p-NITROPHENOL **ICSC: 0066**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-PALE-YELLOW CRYSTALS.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
May explode on heating. Decomposes on heating. This produces toxic fumes including nitrogen oxides. Mixtures with potassium hydroxide are explosive.

Formula: $C_6H_5NO_3$
Molecular mass: 139.1
Decomposes at 279°C
Melting point: 111-116°C
Density: 1.5 g/cm³
Solubility in water, g/100ml at 20°C: 1.24
Vapour pressure, Pa at 20°C: 0.0032
Flash point: 169°C
Auto-ignition temperature: 490°C
Octanol/water partition coefficient as log Pow: 1.91

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the blood. This may result in the formation of methaemoglobin. The effects may be delayed. Medical observation is indicated.

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

Effects of long-term or repeated exposure
Repeated or prolonged contact may cause skin sensitization.

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn; R: 20/21/22-33; S: (2)-28

ACENAPHTHENE **ICSC: 1674 (October 2006)**

1,2-Dihydroacenaphthylene
1,8-Ethylenenaphthalene

CAS #: 83-32-9
UN #: 3077
EC Number: 201-469-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Finely dispersed particles form explosive mixtures in air.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, dry powder, foam, carbon dioxide.

See Notes. PREVENT DISPERSION OF DUST!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

Very toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 9; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

ACENAPHTHENE **ICSC: 1674**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
WHITE-TO-BEIGE CRYSTALS.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
On combustion, forms toxic gases including carbon monoxide. Reacts with strong oxidants.

Formula: $C_{12}H_{10}$
Molecular mass: 154.2
Boiling point: 279°C
Melting point: 95°C
Density: 1.2 g/cm³
Solubility in water, g/100ml at 25°C: 0.0004
Vapour pressure, Pa at 25°C: 0.3
Relative vapour density (air = 1): 5.3
Flash point: 135°C o.c.
Auto-ignition temperature: >450 °C
Octanol/water partition coefficient as log Pow: 3.9/4.5

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

Effects of short-term exposure

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
See Notes.

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES

Acenaphthene occurs as a pure substance and also as a component of polyaromatic hydrocarbon (PAH) mixtures.
Human population studies have associated PAH's exposure with cancer and cardiovascular diseases.
Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

EC Classification

1 Identification

Product identifier

Product name: **Acenaphthalene**

Stock number: L02159
CAS Number:
208-96-8
EC number:
205-917-1
Relevant identified uses of the substance or mixture and uses advised against.
Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet
Manufacturer/Supplier:
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com
Information Department: Health, Safety and Environmental Department
Emergency telephone number:
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)


GHS06 Skull and crossbones

Acute Tox. 3 H301 Toxic if swallowed.
Hazards not otherwise classified No information known.

Label elements
GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
Hazard pictograms


GHS06

Signal word Danger
Hazard statements
H301 Toxic if swallowed.
Precautionary statements
P264 Wash thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor/…
P321 Specific treatment (see on this label).
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
WHMIS classification
D1B - Toxic material causing immediate and serious toxic effects

Classification system
HMIS ratings (scale 0-4)
(Hazardous Materials Identification System)

Health (acute effects) = 1
Flammability = 1
Physical Hazard = 1

Other hazards
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances
CAS# Description:
208-96-8 Acenaphthalene
Identification number(s):
EC number: 205-917-1

4 First-aid measures

Description of first aid measures
After inhalation
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.
After skin contact
Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.
After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.
After swallowing Seek medical treatment.

(Contd. on page 2)

Product name: Acenaphthalene

(Contd. of page 1)

Information for doctor
Most important symptoms and effects, both acute and delayed No further relevant information available.
Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media
Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
Special hazards arising from the substance or mixture
If this product is involved in a fire, the following can be released:
Carbon monoxide and carbon dioxide
Advice for firefighters
Protective equipment:
Wear self-contained respirator.
Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Environmental precautions: Do not allow material to be released to the environment without proper governmental permits.
Methods and material for containment and cleaning up: Dispose of contaminated material as waste according to section 13.
Prevention of secondary hazards: No special measures required.
Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

Handling
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.
Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities
Storage
Requirements to be met by storerooms and receptacles: No special requirements.
Information about storage in one common storage facility: Store away from oxidizing agents.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters
Components with limit values that require monitoring at the workplace: Not required.
Additional information: No data

Exposure controls
Personal protective equipment
General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Maintain an ergonomically appropriate working environment.
Breathing equipment: Use suitable respirator when high concentrations are present.
Protection of hands:
Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.
Eye protection: Safety glasses
Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties
General Information
Appearance:

Form:	Powder
Color:	Light brown
Odor:	Not determined
Odor threshold:	Not determined.
pH-value:	Not applicable.
Change in condition	
Melting point/Melting range:	89-92 °C (192-198 °F)
Boiling point/Boiling range:	265-275 °C (509-527 °F)
Sublimation temperature / start:	Not determined
Flash point:	122 °C (252 °F)
Flammability (solid, gaseous)	Not determined.
Ignition temperature:	Not determined
Decomposition temperature:	Not determined
Auto igniting:	Not determined.
Danger of explosion:	Product does not present an explosion hazard.

(Contd. on page 3)

Product name: Acenaphthalene

(Contd. of page 2)

Explosion limits:	
Lower:	Not determined
Upper:	Not determined
Vapor pressure:	Not applicable.
Density at 20 °C (68 °F):	0.899 g/cm³ (7.502 lbs/gal)
Relative density	Not determined.
Vapor density	Not applicable.
Evaporation rate	Not applicable.
Solubility in / Miscibility with	
Water:	Insoluble
Partition coefficient (n-octanol/water):	Not determined.
Viscosity:	
dynamic:	Not applicable.
kinematic:	Not applicable.
Other information	No further relevant information available.

10 Stability and reactivity

Reactivity No information known.
Chemical stability Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions No dangerous reactions known
Conditions to avoid No further relevant information available.
Incompatible materials: Oxidizing agents
Hazardous decomposition products: Carbon monoxide and carbon dioxide

11 Toxicological information

Information on toxicological effects
Acute toxicity: Harmful if swallowed.
LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: May cause irritation
Eye irritation or corrosion: May cause irritation
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: No effects known.
Carcinogenicity: No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
Reproductive toxicity: No effects known.
Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: No effects known.
Other information (about experimental toxicology):
Mutagenic effects have been observed on tests with human lymphocytes.
Bacterial mutagenicity test: Ames Salmonella Typhimurium: Negative
Subacute to chronic toxicity:
The Registry of Toxic Effects of Chemical Substances (RTECS) reports the following effects in laboratory animals:
Autonomic Nervous System - other (direct) parasympathomimetic.
Lungs, Thorax, or Respiration - respiratory depression
Blood - hemorrhage.
Lungs, Thorax, or Respiration - structural or functional change in trachea or bronchi.
Lungs, Thorax, or Respiration - bronchiolar dilation
Nutritional and Gross Metabolic - weight loss or decreased weight gain.
Immunological Including Allergic - uncharacterized.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Additional ecological information:
General notes:
Do not allow material to be released to the environment without proper governmental permits.
Do not allow undiluted product or large quantities to reach ground water, water course or sewage system.
Avoid transfer into the environment.
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

Not a hazardous material for transportation.

UN-Number	
DOT, IMDG, IATA	None
UN proper shipping name	
DOT, IMDG, IATA	None
Transport hazard class(es)	
DOT, ADR, IMDG, IATA	
Class	None

(Contd. on page 4)

Product name: Acenaphthalene

(Contd. of page 3)

Packing group **DOT, IMDG, IATA**	None
Environmental hazards:	Not applicable.
Special precautions for user	Not applicable.
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.
Transport/Additional information:	Not dangerous according to the above specifications.
DOT **Marine Pollutant (DOT):**	No

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture
GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
Hazard pictograms

GHS06

Signal word Danger
Hazard statements
H301 Toxic if swallowed.
Precautionary statements
P264 Wash thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor/…
P321 Specific treatment (see on this label).
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Non-Domestic Substances List (NDSL).
SARA Section 313 (specific toxic chemical listings) Substance is not listed.
California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use:
For use only by technically qualified individuals.
This product is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.
Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.
The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.
Substance is not listed.
Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.
Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department
Date of preparation / last revision 11/23/2015 / -
Abbreviations and acronyms:
RID: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail)
IATA-DGR: Dangerous Goods Regulations by the "International Air Transport Association" (IATA)
ICAO: International Civil Aviation Organization
ICAO-TI: Technical Instructions by the "International Civil Aviation Organization" (ICAO)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
vPvB: very Persistent and very Bioaccumulative
ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)

ACETOPHENONE **ICSC: 1156 (April 2017)**

1-Phenylethanone
Phenyl methyl ketone
Acetylbenzene

CAS #: 98-86-2

EC Number: 202-708-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Above 77°C explosive vapour/air mixtures may be formed.	NO open flames. Above 77°C use a closed system and ventilation.	Use alcohol-resistant foam, powder, carbon dioxide.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Headache. Dizziness. Drowsiness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Nausea. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants and strong bases. Ventilation along the floor.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

Harmful if swallowed
May be harmful in contact with skin
Causes eye irritation

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

ACETOPHENONE **ICSC: 1156**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID OR WHITE CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers
No data.

Chemical dangers
Reacts with oxidizing materials and strong bases. This generates fire or explosion hazard.

Formula: C_8H_8O / $C_6H_5COCH_3$
Molecular mass: 120.1
Boiling point: 202°C
Melting point: 20°C
Density: 1.03 g/cm³
Solubility in water, g/100ml at 25°C: 0.6 (poor)
Vapour pressure, kPa at 15°C: 0.133
Relative vapour density (air = 1): 4.1
Relative density of the vapour/air-mixture at 20°C (air = 1): 1
Flash point: 77°C c.c.
Auto-ignition temperature: 535°C
Explosive limits, vol% in air: 1 - 5.2 (estimated)
Octanol/water partition coefficient as log Pow: 1.58

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation.

Effects of short-term exposure
The substance is irritating to the eyes. The substance may cause effects on the central nervous system.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA

ENVIRONMENT

Environmental effects of the substance have been adequately investigated, but no significant effects have been found.

NOTES

Use of alcoholic beverages enhances the harmful effect.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn; R: 22-36; S: (2)-26

ANILINE **ICSC: 0011 (April 2014)**

Benzeneamine
Aminobenzene
Phenylamine

CAS #: 62-53-3
UN #: 1547
EC Number: 200-539-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 76°C explosive vapour/air mixtures may be formed.	NO open flames. NO contact with oxidizing agents. Above 76°C use a closed system and ventilation.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS! STRICT HYGIENE! See Notes.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Blue lips, fingernails and skin. Headache. Dizziness. Nausea. Vomiting. Weakness. Laboured breathing. Convulsions.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Administration of oxygen may be needed. Refer immediately for medical attention. See Notes.
Skin	EASILY ABSORBED! Redness. Further see Inhalation.	Protective gloves. Protective clothing.	Administration of oxygen may be needed. Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer immediately for medical attention. See Notes.
Eyes	Redness. Pain. Corneal damage.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Administration of oxygen may be needed. Rinse mouth. Do NOT induce vomiting. Rest. Refer immediately for medical attention. See Notes.

SPILLAGE DISPOSAL

Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants, strong acids and food and feedstuffs. Well closed. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Toxic if swallowed, in contact with skin or if inhaled
Causes damage to red blood cells
Causes damage to the blood through prolonged or repeated exposure
Causes serious eye irritation
May cause an allergic skin reaction
Very toxic to aquatic life

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

ANILINE **ICSC: 0011**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS OILY LIQUID WITH CHARACTERISTIC ODOUR. TURNS BROWN ON EXPOSURE TO AIR OR LIGHT.

Physical dangers

Chemical dangers
Decomposes above 190°C . This produces toxic and corrosive fumes of nitrogen oxides and ammonia and flammable vapours. Reacts with strong acids and strong oxidants. This generates fire and explosion hazard. Attacks copper and its alloys.

Formula: C_6H_7N / $C_6H_5NH_2$
Molecular mass: 93.1
Boiling point: 184°C
Melting point: -6°C
Relative density (water = 1): 1.02
Solubility in water, g/100ml at 20°C: 3.4
Vapour pressure, Pa at 20°C: 40
Relative vapour density (air = 1): 3.2
Flash point: 76°C c.c.
Auto-ignition temperature: 630°C
Explosive limits, vol% in air: 1.2-11.0
Octanol/water partition coefficient as log Pow: 0.94

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin also as a vapour and by ingestion.

Effects of short-term exposure
The substance is severely irritating to the eyes. The substance may cause effects on the blood. This may result in the formation of methaemoglobin. See Notes. Exposure could cause haemolysis. This may result in haemolytic anaemia. The effects may be delayed. Medical observation is indicated.

Inhalation risk
A harmful contamination of the air will be reached on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure
Repeated or prolonged contact may cause skin sensitization. The substance may have effects on the blood. This may result in haemolytic anaemia.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 2 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.
MAK: 7.7 mg/m^3, 2 ppm; peak limitation category: II(2); skin absorption (H); sensitization of skin (SH); carcinogen category: 4; pregnancy risk group: C; BAT issued.
EU-OEL: 7,74 mg/m^3, 2 ppm as TWA; 19,35 mg/m^3, 5 ppm as STEL; (skin)

ENVIRONMENT

The substance is very toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

In case of blue lips, fingernails or skin treatment with 100% oxygen may be needed; the appropriate means with instructions must be available.
Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.
Specific treatment with antidotes like methylene blue can not be used for pregnant women and persons with a G6PD enzyme deficiency. These people should avoid all contact.
The odour warning when the exposure limit value is exceeded is insufficient.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 23/24/25-40-41-43-48/23/24/25-68-50; S: (1/2)-26-27-36/37/39-45-46-63-61

ANTHRACENE **ICSC: 0825 (March 1999)**

Anthracin
Paranaphthalene

CAS #: 120-12-7

EC Number: 204-371-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Finely dispersed particles form explosive mixtures in air.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT DISPERSION OF DUST!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use ventilation (not if powder), local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles, face shield or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain.	Do not eat, drink, or smoke during work.	Rinse mouth. Rest. Refer for medical attention .

SPILLAGE DISPOSAL

Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment. Personal protection: P2 filter respirator for harmful particles.

STORAGE

Separated from strong oxidants. Well closed.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

ANTHRACENE **ICSC: 0825**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
WHITE CRYSTALS OR FLAKES.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
Decomposes on heating. Decomposes under the influence of strong oxidants. This produces acrid, toxic fume. This generates fire and explosion hazard.

Formula: $C_{14}H_{10}$ / $(C_6H_4CH)_2$
Molecular mass: 178.2
Boiling point: 342°C
Melting point: 218°C
Density: 1.25-1.28 g/cm³
Solubility in water, g/100ml at 20°C: 0.00013
Vapour pressure, Pa at 25°C: 0.08
Relative vapour density (air = 1): 6.15
Flash point: 121°C
Auto-ignition temperature: 538°C
Explosive limits, vol% in air: 0.6-?
Octanol/water partition coefficient as log Pow: 4.5 (calculated)

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation.

Effects of short-term exposure
The substance is mildly irritating to the skin and respiratory tract.

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis under the influence of UV light.

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

ADDITIONAL INFORMATION

EC Classification

ATRAZINE **ICSC: 0099 (November 2009)**

2-Chloro-4-ethylamino-6-isopropylamino-1,3,5-triazine
6-Chloro-N-ethyl-N'-(1-methylethyl)-1,3,5-triazine-2,4-diamine
2-Chloro-4-ethylamino-6-isopropylamino-s-triazine

CAS #: 1912-24-9

EC Number: 217-617-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion if formulations contain flammable/explosive solvents.	NO open flames.	Use water spray, foam, powder, carbon dioxide.

PREVENT DISPERSION OF DUST!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use ventilation (not if powder).	Fresh air, rest.
Skin		Protective gloves.	Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible). Refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

Causes serious eye irritation
May cause damage to liver through prolonged or repeated exposure
Toxic to aquatic life

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

ATRAZINE **ICSC: 0099**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS CRYSTALS.

Physical dangers
No data.

Chemical dangers
Decomposes on heating. This produces toxic fumes including hydrogen chloride and nitrogen oxides.

Formula: $C_8H_{14}ClN_5$
Molecular mass: 215.7
Boiling point: No boiling point at normal pressure; decomposes on heating
See Notes.
Melting point: 173-177°C
Relative density (water = 1): 1.2
Solubility in water, g/100ml at 25°C: (none)
Vapour pressure, Pa at 20°C: (negligible)
Octanol/water partition coefficient as log Pow: 2.34

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by ingestion.

Effects of short-term exposure
The substance is severely irritating to the eyes.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
The substance may have effects on the liver. This may result in tissue lesions.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 2 mg/m^3, as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: 1 mg/m^3; peak limitation category: II(2); pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

Temperature of decomposition is unknown in the literature.
Carrier solvents used in commercial formulations may change physical and toxicological properties.
If the substance is formulated with solvent(s) also consult the card(s) (ICSC) of the solvent(s).

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 43-48/22-50/53; S: (2)-36/37-60-61

BENZ(a)ANTHRACENE **ICSC: 0385 (November 2016)**

1,2-Benzoanthracene
Benzo(a)anthracene
2,3-Benzphenanthrene
Naphthanthracene

CAS #: 56-55-3
UN #: 3077
EC Number: 200-280-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Finely dispersed particles form explosive mixtures in air.	NO contact with oxidizing agents. NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, carbon dioxide, foam. In case of fire in the surroundings, use appropriate extinguishing media.

See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety goggles, face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Seek medical attention if you feel unwell.

SPILLAGE DISPOSAL

Personal protection: complete protective clothing including self-contained breathing apparatus. Wet powder to prevent dusting and ignition. Do NOT let this chemical enter the environment. Vacuum spilled material with specialist equipment. Sweep spilled substance into sealable containers. Then store and dispose of according to local regulations.

STORAGE

Separated from oxidizing materials. Store in an area without drain or sewer access. Well closed.

PACKAGING

Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

May cause cancer
Very toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 9; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

BENZ(a)ANTHRACENE **ICSC: 0385**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-YELLOW-BROWN FLUORESCENT FLAKES OR POWDER.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
Reacts with oxidizing substances.

Formula: $C_{18}H_{12}$
Molecular mass: 228.3
Sublimation point: 435°C
Melting point: 162°C
Relative density (water = 1): 1.274
Solubility in water: none
Vapour pressure, Pa at 20°C: 292
Octanol/water partition coefficient as log Pow: 5.61

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin, by ingestion and through the eyes.

Effects of short-term exposure
See Notes.

Inhalation risk
A nuisance-causing concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
This substance is probably carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: A2 (suspected human carcinogen); BEI issued.
MAK skin absorption (H).
MAK: carcinogen category: 2; germ cell mutagen group: 3A

ENVIRONMENT

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. Bioaccumulation of this chemical may occur in aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.
Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 45-50/53; S: 53-45-60-61

BENZALDEHYDE **ICSC: 0102 (April 2006)**

Benzoic aldehyde
Artificial almond oil
Benzenecarbonal

CAS #: 100-52-7
UN #: 1990
EC Number: 202-860-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 63°C explosive vapour/air mixtures may be formed.	NO open flames. Above 63°C use a closed system and ventilation.	Use water spray, foam, powder, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety spectacles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Sore throat.	Do not eat, drink, or smoke during work.	Rinse mouth. Rest.

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from incompatible materials. See Chemical Dangers. Well closed. Ventilation along the floor. Cool. Store in an area without drain or sewer access. Keep in the dark.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

Flammable liquid and vapour
Harmful if swallowed or in contact with skin
Toxic to aquatic life

Transportation
UN Classification
UN Hazard Class: 9; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

BENZALDEHYDE **ICSC: 0102**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-YELLOW LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
The substance can form explosive peroxides under special conditions. Reacts violently with aluminium, bases, iron, oxidants and phenol. This generates fire and explosion hazard.

Formula: C_7H_6O / C_6H_5CHO
Molecular mass: 106.1
Boiling point: 179°C
Melting point: -26°C
Relative density (water = 1): 1.05
Solubility in water at 25°C: poor
Vapour pressure, Pa at 26°C: 133
Relative vapour density (air = 1): 3.7
Flash point: 63°C c.c.
Auto-ignition temperature: 192°C
Explosive limits, vol% in air: 1.4
Octanol/water partition coefficient as log Pow: 1.48

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes.

Inhalation risk
No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Rinse contaminated clothing with plenty of water because of fire hazard.
Check for peroxides prior to distillation; eliminate if found.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn; R: 22; S: (2)-24

BENZIDINE **ICSC: 0224 (November 2009)**

(1,1'-Biphenyl)-4,4'-diamine
4,4'-Diaminobiphenyl
p-Diaminodiphenyl
Biphenyl-4,4'-ylenediamine

CAS #: 92-87-5
UN #: 1885
EC Number: 202-199-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, foam, powder, carbon dioxide.

See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. AVOID ALL CONTACT!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use closed system and ventilation.	Fresh air, rest.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Wear protective gloves when administering first aid.
Eyes		Wear face shield or eye protection in combination with breathing protection if powder.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

SPILLAGE DISPOSAL

Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from strong oxidants and food and feedstuffs. Keep in the dark. Well closed. Store in an area without drain or sewer access.

PACKAGING

Unbreakable packaging.
Put breakable packaging into closed unbreakable container.
Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Harmful if swallowed
Suspected of causing genetic defects
May cause cancer
Very toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

BENZIDINE **ICSC: 0224**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS OR REDDISH CRYSTALLINE POWDER. TURNS DARK ON EXPOSURE TO AIR AND LIGHT.

Physical dangers
No data.

Chemical dangers
Decomposes on heating and on burning. This produces toxic fumes including nitrogen oxides. Reacts violently with strong oxidants, especially nitric acid.

Formula: $C_{12}H_{12}N_2$ / $NH_2C_6H_4$-$C_6H_4NH_2$
Molecular mass: 184.2
Boiling point: 401°C
Melting point: 120°C
Density: 1.3 g/cm³
Solubility in water, g/100ml at 25°C: <0.05 (very poor)
Relative vapour density (air = 1): 6.4
Octanol/water partition coefficient as log Pow: 1.34

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

Effects of short-term exposure

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed, especially if powdered.

Effects of long-term or repeated exposure
This substance is carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: A1 (confirmed human carcinogen); (skin).
MAK: carcinogen category: 1.
MAK skin absorption (H)

ENVIRONMENT

The substance is very toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

Do NOT take working clothes home.
TLV Note: Exposure by all routes should be carefully controlled to levels as low as possible.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 45-22-50/53; S: 53-45-60-61; Note: E

BENZO(a)PYRENE **ICSC: 0104 (April 2014)**

Benz(a)pyrene
3,4-Benzopyrene
Benzo(d,e,f)chrysene

CAS #: 50-32-8
UN #: 3077
EC Number: 200-028-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media.

See Notes. AVOID ALL CONTACT! PREVENT DISPERSION OF DUST!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use closed system and ventilation.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from strong oxidants. Store in an area without drain or sewer access. Cool. Dry.

PACKAGING

Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

May cause an allergic skin reaction
May cause cancer
May cause genetic defects
May damage fertility or the unborn child
Very toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 9; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

BENZO(a)PYRENE **ICSC: 0104**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
PALE YELLOW CRYSTALS.

Physical dangers

Chemical dangers
Reacts with strong oxidants. Decomposes on heating. This produces toxic fumes.

Formula: $C_{20}H_{12}$
Molecular mass: 252.3
Boiling point: 496°C
Melting point: 178.1°C
Density (at 20°C): 1.4 g/cm³
Solubility in water, g/100ml at 20°C: < 0.1 (poor)
Vapour pressure at 20°C: negligible
Octanol/water partition coefficient as log Pow: 6.04

EXPOSURE & HEALTH EFFECTS

Routes of exposure
Exposure mainly occurs via inhalation.

Effects of short-term exposure
See Notes.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
Repeated or prolonged contact may cause skin sensitization. This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells. May cause toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: A2 (suspected human carcinogen); BEI issued.
MAK: skin absorption (H); carcinogen category: 2; germ cell mutagen group: 2

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish, plants and molluscs. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES

Do NOT take working clothes home.
Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.
Benzo(a)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAHs) in the environment, usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 45-46-60-61-43-50/53; S: 53-45-60-61

BENZO(b)FLUORANTHENE **ICSC: 0720 (March 1999)**

Benz(e)acephenanthrylene
2,3-Benzofluoroanthene
Benzo(e)fluoranthene
3,4-Benzofluoranthene

CAS #: 205-99-2

EC Number: 205-911-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION			In case of fire in the surroundings, use appropriate extinguishing media.

AVOID ALL CONTACT!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	**According to UN GHS Criteria**
STORAGE	**Transportation** **UN Classification**
Provision to contain effluent from fire extinguishing. Well closed.	
PACKAGING	

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

BENZO(b)FLUORANTHENE **ICSC: 0720**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS CRYSTALS.

Physical dangers

Chemical dangers
Upon heating, toxic fumes are formed. Decomposes on heating. This produces toxic fumes.

Formula: $C_{20}H_{12}$
Molecular mass: 252.3
Boiling point: 481°C
Melting point: 168°C
Solubility in water: none
Octanol/water partition coefficient as log Pow: 6.12

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

Effects of short-term exposure

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure
This substance is possibly carcinogenic to humans. May cause genetic damage in humans.

OCCUPATIONAL EXPOSURE LIMITS

MAK: skin absorption (H); carcinogen category: 2; germ cell mutagen group: 3B

ENVIRONMENT

This substance may be hazardous to the environment. Special attention should be given to air quality and water quality.

NOTES

Benzo(b)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.
ACGIH recommends environment containing benzo(b)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m³.
TLV Note: Exposure by all routes should be carefully controlled to levels as low as possible.
Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 45-50/53; S: 53-45-60-61

BENZO(ghi)PERYLENE **ICSC: 0739 (October 1999)**

1,12-Benzoperylene
1,12-Benzperylene

CAS #: 191-24-2

EC Number: 205-883-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions.	NO open flames.	In case of fire in the surroundings, use appropriate extinguishing media.

PREVENT DISPERSION OF DUST!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.

STORAGE

Well closed.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

BENZO(ghi)PERYLENE **ICSC: 0739**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
PALE YELLOW-GREEN CRYSTALS.

Physical dangers

Chemical dangers
Upon heating, toxic fumes are formed. Decomposes on heating. This produces toxic fumes.

Formula: $C_{22}H_{12}$
Molecular mass: 276.3
Boiling point: 550°C
Melting point: 278°C
Density: 1.3 g/cm³
Solubility in water: none
Octanol/water partition coefficient as log Pow: 6.58

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

Effects of short-term exposure

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

This substance may be hazardous to the environment. Special attention should be given to air quality and water quality.

NOTES

Benzo(ghi)perylene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.
Data are insufficiently available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

EC Classification

BENZO(k)FLUORANTHENE **ICSC: 0721 (March 1999)**

Dibenzo(b,jk)fluorene
8,9-Benzofluoranthene
11,12-Benzofluoranthene

CAS #: 207-08-9

EC Number: 205-916-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION			In case of fire in the surroundings, use appropriate extinguishing media.

AVOID ALL CONTACT!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	**According to UN GHS Criteria** **Transportation** **UN Classification**
STORAGE	
Provision to contain effluent from fire extinguishing. Well closed.	
PACKAGING	

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

BENZO(k)FLUORANTHENE **ICSC: 0721**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
YELLOW CRYSTALS.

Physical dangers

Chemical dangers
Upon heating, toxic fumes are formed. Decomposes on heating. This produces toxic fumes.

Formula: $C_{20}H_{12}$
Molecular mass: 252.3
Boiling point: 480°C
Melting point: 217°C
Solubility in water: none
Octanol/water partition coefficient as log Pow: 6.84

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

Effects of short-term exposure

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure
This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

MAK: skin absorption (H); carcinogen category: 2; germ cell mutagen group: 3B

ENVIRONMENT

This substance may be hazardous to the environment. Special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in crustacea and fish.

NOTES

Benzo(k)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.
ACGIH recommends environment containing benzo(k)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m³.
Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 45-50/53; S: 53-45-60-61

BENZOIC ACID **ICSC: 0103 (October 1999)**

Benzenecarboxylic acid
Phenyl carboxylic acid

CAS #: 65-85-0

EC Number: 200-618-2

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Finely dispersed particles form explosive mixtures in air.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness. Burning sensation. Itching.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: protective clothing and face shield. Sweep spilled substance into covered plastic containers. If appropriate, moisten first to prevent dusting. Wash away remainder with plenty of water.

STORAGE

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

BENZOIC ACID **ICSC: 0103**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
WHITE CRYSTALS OR POWDER.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
The solution in water is a weak acid. Reacts with oxidants.

Formula: $C_7H_6O_2$ / C_6H_5COOH
Molecular mass: 122.1
Boiling point: 249°C
Melting point: 122°C
See Notes.
Density: 1.3 g/cm³
Solubility in water, g/100ml at 20°C: 0.29
Vapour pressure, Pa at 25°C: 0.1
Relative vapour density (air = 1): 4.2
Relative density of the vapour/air-mixture at 20°C (air = 1): 1
Flash point: 121°C c.c.
Auto-ignition temperature: 570°C
Octanol/water partition coefficient as log Pow: 1.87

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. Exposure could cause a non-allergic rash on contact.

Inhalation risk
No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

MAK: (respirable fraction): 0.5 mg/m^3, 0.1 ppm; peak limitation category: II(4); skin absorption (H); pregnancy risk group: C

ENVIRONMENT

NOTES

The substance begins to sublime at 100°C.

ADDITIONAL INFORMATION

EC Classification

BENZYL ALCOHOL **ICSC: 0833 (April 2000)**

Benzenemethanol
Phenyl carbinol
alpha-Hydroxytoluene
Benzoyl alcohol
Phenyl methanol

CAS #: 100-51-6

EC Number: 202-859-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	NO open flames.	Use powder, AFFF, foam, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Dizziness. Headache.	Use ventilation.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again.
Eyes	Redness.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Drowsiness. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance.

STORAGE

Separated from strong oxidants.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

BENZYL ALCOHOL **ICSC: 0833**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Reacts with strong oxidants. Attacks some forms of plastic. On combustion, forms toxic gases including carbon monoxide.

Formula: C_7H_8O / $C_6H_5CH_2OH$
Molecular mass: 108.1
Boiling point: 205°C
Melting point: -15°C
Relative density (water = 1): 1.04
Solubility in water, g/100ml: 4
Vapour pressure, Pa at 20°C: 13.2
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0
Flash point: 93°C c.c.
Auto-ignition temperature: 436°C
Explosive limits, vol% in air: 1.3-13
Octanol/water partition coefficient as log Pow: 1.1

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

Effects of short-term exposure
The aerosol is irritating to the eyes and skin. The substance may cause effects on the nervous system.

Inhalation risk
No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact may cause skin sensitization.

OCCUPATIONAL EXPOSURE LIMITS

MAK: 22 mg/m^3, 5 ppm; peak limitation category: I(2); skin absorption (H); pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms.

NOTES

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn; R: 20/22; S: (2)-26

Matrix Scientific

PO BOX 25067
COLUMBIA, SC 29224-5067
Telephone: 803-788-9494 Fax: 803-788-9419

SAFETY DATA SHEET

Transportation Emergency: 3E Co. (5025) 800-451-8346

1. Product Identification

Name Bis(2-chloroethoxy)methane

Catalog Number	007514
CAS Registry Number	[111-91-1]
Company	Matrix Scientific
Physical Address	131 Pontiac Business Center Drive Elgin, SC 29045 USA
Telephone/Fax	(803)788-9494/(803)788-9419

2. Hazard Identification

Hazardous Ingredients Bis(2-chloroethoxy)methane

GHS label elements, including precautionary statements

Pictogram

Signal word WARNING

Hazard statement(s)

H302	Harmful if swallowed
H315	Causes skin irritation
H317	H317 May cause an allergic skin reaction
H319	Causes serious eye irritation
H319	H319 Causes serious eye irritation
H332	Harmful if inhaled
H335	May cause respiratory irritation

Precautionary statement(s)

P233	Keep container tightly closed.
P261	Avoid breathing dust/fume/ gas/mist/vapours/spray.
P264	Wash … thoroughly after handling.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P305+351+338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do - continue rinsing.

3. Composition, Information or Ingredients

Name Bis(2-chloroethoxy)methane

4. First Aid Measures

Eye Contact: Check for and remove any contact lenses. Immediately flush eyes with clean, running water for at least 15 minutes while keeping eyes open. Cool water may be used. Seek medical attention.

Skin Contact: After contact with skin, wash with generous quantities of running water. Gently and thoroughly wash affected area with running water and non-abrasive soap. Cool water may be used. Cover the affected area with emollient. Seek medical attention. Wash any contaminated clothing prior to reusing.

Inhalation: Remove the victim from the source of exposure to fresh, uncontaminated air. If victim's breathing is difficult, administer oxygen. Seek medical attention.

Ingestion: Do NOT induce vomiting. Give water to victim to drink. Seek medical attention.

5. Fire-Fighting Measures

Extinguishing media: Carbon dioxide, dry chemical powder, alcohol or polymer foam.

Special fire fighting procedures: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual fire and explosion hazards/ decomposition of product: Emits toxic fumes under fire conditions.

6. Accidental Release Measures

Steps to be taken if material is spilled or otherwise released into the environment - Wear Appropriate respirator, impervious boots and heavy rubber (or otherwise impervious) gloves. Scoop up solid material or absorb liquid material and place into appropriate container. Ventilate area and wash affected spill area after pickup is complete. Wash skin immediately with plenty of water. Place solid or absorbed material into containers and close for disposal.

7. Handling and Storage

Avoid prolonged exposure.
Use caution when handling.
Exposure to any chemical should be limited.
Do not breath dust or vapor.
Have safety shower and eye wash available.
Do not get in eyes, on skin or on clothing.
Keep container tightly closed.
Store in a cool, dry, well-ventilated place.

Ensure adequate ventilation during use.
Use only in a chemical fume hood.
To the best of our knowledge, the health hazards of this product have not been fully investigated.
This product is provided solely for the purpose of research and development.

8. Exposure Controls and Personal Protection

Wear Protective safety goggles.
Wear chemical-resistant gloves.
Wear protective clothing and chemical resistant boots.
Ensure ventilation during use.
After contact with skin, wash immediately.

9. Physical and Chemical Properties

Appearance: liquid
Molecular Formula: C5H10Cl2O2
Molecular Weight: 173.04
Boiling point (C): 112°/20mm(217°)
Melting point (C): -32°
Density (g/ml): 1.23
Index of refraction: 1.45

10. Stability and Reactivity

Incompatibilities: Strong oxidizing agents
Strong acids and bases

Hazard Decomposition Products

Carbon	carbon monoxide
	carbon dioxide
Chlorine	hydrogen chloride

11. Toxicological Information

Acute effects:
Irritant
May be harmful by ingestion and inhalation.
Material is irritating to mucous membranes and upper respiratory tract.
To the best of our knowledge, the toxicological properties of this product have not been fully investigated or determined.

12. Ecological Information

Mobility: Data not known
Persistence and degradability: No data available
Cumulative potential: No data available

Other adverse effects: No data available

13. Disposal Considerations

Absent other actions demanded by federal or local regulations - Dissolve or mix the material with a combustible solvent and burn in a requlated, chemical incinerator equipped with after burner and scrubber.
Observe all federal, state and local laws.

14. Transport Information

Shipping Name Classed non-hazardous for shipment

15. Regulatory Information

Adhere to all Federal, State and local regulations.

16. Other Information

The information contained herein is accurate to the best of our knowledge, but is not meant to be complete and is included only as a guide. The end user is responsible for any damage resulting from handling or from contact with this product.

BIS(2-CHLOROETHYL) ETHER **ICSC: 0417 (April 2000)**

Dichloroethyl ether
2,2'-Dichloroethyl ether
1,1'-Oxybis(2-chloro)ethane
sym-Dichloroethyl ether
Diethylene glycol dichloride

CAS #: 111-44-4
UN #: 1916
EC Number: 203-870-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Gives off irritating or toxic fumes (or gases) in a fire. Above 55°C explosive vapour/air mixtures may be formed.	NO open flames, NO sparks and NO smoking. Above 55°C use a closed system and ventilation.	Use water spray, foam, powder, carbon dioxide. In case of fire: keep cylinder cool by spraying with water. NO direct contact with water.

PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Nausea. Vomiting. Burning sensation. Laboured breathing. Symptoms may be delayed. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Refer for medical attention.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Nausea. Vomiting. Burning sensation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Rest. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: chemical protection suit. Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Separated from food and feedstuffs. See Chemical Dangers. Keep in the dark. Well closed.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Subsidiary Risks: 3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

BIS(2-CHLOROETHYL) ETHER **ICSC: 0417**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
CLEAR COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air.

Chemical dangers
The substance can form explosive peroxides on exposure to air and light. Decomposes on burning. Decomposes on contact with water. This produces toxic fumes including hydrogen chloride. Reacts with strong oxidants. Reacts violently with chlorosulfonic acid and oleum.

Formula: $C_4H_8Cl_2O$ / $(ClCH_2CH_2)_2O$
Molecular mass: 143.02
Boiling point: 178°C
Melting point: -50°C
Relative density (water = 1): 1.22
Vapour pressure, kPa at 25°C: 0.206
Relative vapour density (air = 1): 4.9
Flash point: 55°C c.c.
Auto-ignition temperature: 369°C
Explosive limits, vol% in air: 2.7-?
Octanol/water partition coefficient as log Pow: 1.29

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes and respiratory tract. Inhalation of the vapour may cause lung oedema. See Notes. Exposure far above the OEL could cause death. The effects may be delayed. Medical observation is indicated.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as TWA; 10 ppm as STEL; (skin); A4 (not classifiable as a human carcinogen).
MAK: 59 mg/m^3, 10 ppm; peak limitation category: I(1); skin absorption (H)

ENVIRONMENT

NOTES

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort.
Rest and medical observation are therefore essential.
Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered.
An added stabilizer or inhibitor can influence the toxicological properties of this substance, consult an expert.
Check for peroxides prior to distillation; eliminate if found.

ADDITIONAL INFORMATION

EC Classification
Symbol: T+; R: 10-26/27/28-40; S: (1/2)-7/9-27-28-36/37-45

DICHLOROISOPROPYL ETHER **ICSC: 0435 (November 2003)**

Bis(2-chloro-1-methylethyl) ether
2,2'-Oxybis(1-chloropropane)
Dichlorodiisopropyl ether

CAS #: 108-60-1
UN #: 2490
EC Number: 203-598-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 85°C explosive vapour/air mixtures may be formed.	NO open flames. Above 85°C use a closed system and ventilation.	Use water spray, foam, alcohol-resistant foam, dry powder, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust.	Fresh air, rest.
Skin	Dry skin.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Give one or two glasses of water to drink.

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable plastic containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Cool. Keep in the dark. Separated from incompatible materials. See Chemical Dangers.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

DICHLOROISOPROPYL ETHER **ICSC: 0435**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-BROWN OILY LIQUID.

Physical dangers

Chemical dangers
The substance can form explosive peroxides on standing in contact with air. Reacts with halogens, strong acids and strong oxidants. Decomposes on burning. This produces toxic fumes.

Formula: $C_6H_{12}Cl_2O$ / $(ClCH_2C(CH_3)H)_2O$
Molecular mass: 171.1
Boiling point: 187°C
Melting point: -97 - -102°C
Relative density (water = 1): 1.1
Solubility in water, g/100ml at 20°C: 0.2 (poor)
Vapour pressure, Pa at 20°C: 75
Relative vapour density (air = 1): 6
Flash point: 85°C o.c.
Octanol/water partition coefficient as log Pow: 2.14/2.58

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure
See Notes.

Inhalation risk
No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking.

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

Environmental effects from the substance have not been investigated adequately.

NOTES

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

EC Classification

BUTYL BENZYL PHTHALATE **ICSC: 0834 (October 2005)**

Benzyl butyl phthalate
1,2-Benzenedicarboxylic acid, butyl phenylmethyl ester
BBP

CAS #: 85-68-7
UN #: 3082
EC Number: 201-622-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use alcohol-resistant foam, powder, carbon dioxide, water spray.

See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. PREVENT GENERATION OF MISTS! AVOID EXPOSURE OF (PREGNANT) WOMEN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use ventilation, local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Store in an area without drain or sewer access. Separated from strong oxidants.

PACKAGING

Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 9; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

BUTYL BENZYL PHTHALATE **ICSC: 0834**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS OILY LIQUID.

Physical dangers

Chemical dangers
Decomposes on burning. This produces toxic fumes. Reacts with oxidants.

Formula: 1,2-$C_6H_4(COOCH_2C_6H_5)(COOC_4H_9)$ / $C_{19}H_{20}O_4$
Molecular mass: 312.4
Boiling point: 370°C
Melting point: -35°C
Relative density (water = 1): 1.1
Solubility in water, mg/l: 0.71 (very poor)
Vapour pressure at 20°C: negligible
Relative vapour density (air = 1): 10.8
Flash point: 198°C
Auto-ignition temperature: 425°C
Octanol/water partition coefficient as log Pow: 4.77

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Effects of short-term exposure

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying.

Effects of long-term or repeated exposure
Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

MAK: (inhalable fraction): 20 mg/m^3; peak limitation category: II(2); pregnancy risk group: C

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish.

NOTES

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 61-62-50/53; S: 45-53-60-61

CAPROLACTAM **ICSC: 0118 (November 2009)**

Hexahydro-2H-azepin-2-one
Aminocaproic lactam
epsilon-Caprolactam

CAS #: 105-60-2

EC Number: 203-313-2

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use foam, powder, carbon dioxide, water in large amounts.

PREVENT DISPERSION OF DUST!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Abdominal cramps. Dizziness. Headache. Confusion.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible). Refer for medical attention.
Ingestion	Nausea. Vomiting. Abdominal pain. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Let solidify. Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Wash away remainder with plenty of water.

STORAGE

Separated from strong oxidants. Dry.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

Harmful if swallowed
Causes skin and eye irritation
May cause drowsiness or dizziness

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

CAPROLACTAM **ICSC: 0118**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
WHITE HYGROSCOPIC CRYSTALS OR FLAKES.

Physical dangers
No data.

Chemical dangers
Decomposes on heating. This produces toxic fumes including nitrogen oxides and ammonia. Reacts violently with strong oxidants. This produces toxic fumes.

Formula: $C_6H_{11}NO$
Molecular mass: 113.2
Boiling point: 267°C
Melting point: 70°C
Relative density (water = 1): 1.02
Solubility in water: good
Vapour pressure, Pa at 25°C: 0.26
Relative vapour density (air = 1): 3.91
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0
Flash point: 125°C o.c.
Auto-ignition temperature: 375°C
Explosive limits, vol% in air: 1.4-8
Octanol/water partition coefficient as log Pow: -0.19

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol.

Effects of short-term exposure
The substance is irritating to the skin, eyes and respiratory tract. The substance may cause effects on the central nervous system.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the nervous system and liver.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 mg/m^3, as TWA; A5 (not suspected as a human carcinogen).
MAK: (inhalable fraction): 5 mg/m^3; peak limitation category: I(2); pregnancy risk group: C.
EU-OEL: 10 mg/m^3 as TWA; 40 mg/m^3 as STEL

ENVIRONMENT

This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

The substance is usually used, stored and transported in liquefied (molten) form at about 80°C.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn; R: 20/22-36/37/38; S: (2)

1 Identification

Product identifier

Product name: Carbazole

Stock number: L03718
CAS Number:
86-74-8
EC number:
201-696-0
Relevant identified uses of the substance or mixture and uses advised against.
Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet
Manufacturer/Supplier:
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com
Information Department: Health, Safety and Environmental Department
Emergency telephone number:
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)

GHS08 Health hazard

Carc. 2 H351 Suspected of causing cancer.
Hazards not otherwise classified No information known.

Label elements
GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
Hazard pictograms

GHS08

Signal word Warning
Hazard statements
H351 Suspected of causing cancer.
Precautionary statements
P281 Use personal protective equipment as required.
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P308+P313 IF exposed or concerned: Get medical advice/attention.
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
WHMIS classification
D2A - Very toxic material causing other toxic effects

Classification system
HMIS ratings (scale 0-4)
(Hazardous Materials Identification System)

Health (acute effects) = 1
Flammability = 1
Physical Hazard = 1

Other hazards
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances
CAS# Description:
86-74-8 Carbazole
Identification number(s):
EC number: 201-696-0

4 First-aid measures

Description of first aid measures
After inhalation
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.
After skin contact
Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.
After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.
After swallowing Seek medical treatment.

(Contd. on page 2)

Product name: Carbazole

(Contd. of page 1)

Information for doctor
Most important symptoms and effects, both acute and delayed No further relevant information available.
Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media
Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
Special hazards arising from the substance or mixture
If this product is involved in a fire, the following can be released:
Carbon monoxide and carbon dioxide
Nitrogen oxides (NOx)
Advice for firefighters
Protective equipment:
Wear self-contained respirator.
Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Environmental precautions: Do not allow material to be released to the environment without proper governmental permits.
Methods and material for containment and cleaning up: Dispose of contaminated material as waste according to section 13.
Prevention of secondary hazards: No special measures required.
Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

Handling
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.
Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities
Storage
Requirements to be met by storerooms and receptacles: No special requirements.
Information about storage in one common storage facility: Store away from oxidizing agents.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters
Components with limit values that require monitoring at the workplace:
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.
Additional information: No data

Exposure controls
Personal protective equipment
General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Maintain an ergonomically appropriate working environment.
Breathing equipment: Use suitable respirator when high concentrations are present.
Protection of hands:
Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.
Penetration time of glove material (in minutes) Not determined
Eye protection: Safety glasses
Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties
General Information
Appearance:

Form:	Powder
Color:	White to pale brown
Odor:	Odorless
Odor threshold:	Not determined.
pH-value:	Not applicable.
Change in condition	
Melting point/Melting range:	240-246 °C (464-475 °F)
Boiling point/Boiling range:	354-356 °C (669-673 °F)
Sublimation temperature / start:	Not determined
Flash point:	220 °C (428 °F)
Flammability (solid, gaseous)	Not determined.
Ignition temperature:	Not determined
Decomposition temperature:	Not determined

(Contd. on page 3)

Product name: Carbazole

(Contd. of page 2)

Auto igniting:	Not determined.
Danger of explosion:	Not determined.
Explosion limits:	
Lower:	Not determined
Upper:	Not determined
Vapor pressure:	Not applicable.
Density at 20 °C (68 °F):	1.15 g/cm³ (9.597 lbs/gal)
Relative density	Not determined.
Vapor density	Not applicable.
Evaporation rate	Not applicable.
Solubility in / Miscibility with	
Water:	Insoluble
Partition coefficient (n-octanol/water):	Not determined.
Viscosity:	
dynamic:	Not applicable.
kinematic:	Not applicable.
Other information	No further relevant information available.

10 Stability and reactivity

Reactivity No information known.
Chemical stability Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions Reacts with strong oxidizing agents
Conditions to avoid No further relevant information available.
Incompatible materials: Oxidizing agents
Hazardous decomposition products:
Carbon monoxide and carbon dioxide
Nitrogen oxides

11 Toxicological information

Information on toxicological effects
Acute toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance.
LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: May cause irritation
Eye irritation or corrosion: May cause irritation
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains mutation data for this substance.
Carcinogenicity:
Suspected of causing cancer.
IARC-3: Not classifiable as to carcinogenicity to humans.
Reproductive toxicity: No effects known.
Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: No effects known.
Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Ecotoxical effects:
Remark: Very toxic for aquatic organisms
Additional ecological information:
General notes:
Do not allow material to be released to the environment without proper governmental permits.
Do not allow product to reach ground water, water course or sewage system, even in small quantities.
Danger to drinking water if even extremely small quantities leak into the ground.
Also poisonous for fish and plankton in water bodies.
May cause long lasting harmful effects to aquatic life.
Avoid transfer into the environment.
Very toxic for aquatic organisms
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

UN-Number	
DOT, IMDG, IATA	UN3077
UN proper shipping name	
DOT	Environmentally hazardous substances, solid, n.o.s. (Carbazole)
IMDG, IATA	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Carbazole)

(Contd. on page 4)

Product name: Carbazole

(Contd. of page 3)

Transport hazard class(es)

DOT, IMDG

Class	9 Miscellaneous dangerous substances and articles.
Label	9
Class	9 (M7) Miscellaneous dangerous substances and articles
Label	9

IATA

Class	9 Miscellaneous dangerous substances and articles.
Label	9
Packing group	
DOT, IMDG, IATA	III
Environmental hazards:	
Special marking (ADR):	Symbol (fish and tree)
Special marking (IATA):	Symbol (fish and tree)
Special precautions for user	Warning: Miscellaneous dangerous substances and articles
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.
Transport/Additional information:	
DOT	
Marine Pollutant (DOT):	No
UN "Model Regulation":	UN3077, Environmentally hazardous substances, solid, n.o.s. (Carbazole), 9, III

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture
GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
Hazard pictograms

GHS08

Signal word Warning
Hazard statements
H351 Suspected of causing cancer.
Precautionary statements
P281 Use personal protective equipment as required.
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P308+P313 IF exposed or concerned: Get medical advice/attention.
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Domestic Substances List (DSL).
SARA Section 313 (specific toxic chemical listings) Substance is not listed.
California Proposition 65

Prop 65 - Chemicals known to cause cancer	
86-74-8	Carbazole

Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use: For use only by technically qualified individuals.
Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.
The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.
Substance is not listed.
Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.
Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department
Date of preparation / last revision 11/23/2015 / -
Abbreviations and acronyms:
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
vPvB: very Persistent and very Bioaccumulative
ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)

CHRYSENE **ICSC: 1672 (October 2006)**

Benzo[a]phenanthrene
1,2-Benzophenanthrene
1,2,5,6-Dibenzonaphthalene

CAS #: 218-01-9
UN #: 3077
EC Number: 205-923-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Finely dispersed particles form explosive mixtures in air.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, dry powder, foam, carbon dioxide.

See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. AVOID ALL CONTACT!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

Suspected of causing cancer
Very toxic to aquatic life
Toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 9; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

CHRYSENE **ICSC: 1672**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-BEIGE CRYSTALS OR POWDER.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
Decomposes on burning. This produces toxic fumes. Reacts violently with strong oxidants.

Formula: $C_{18}H_{12}$
Molecular mass: 228.3
Boiling point: 448°C
Melting point: 254 - 256°C
Density: 1.3 g/cm³
Solubility in water: very poor
Octanol/water partition coefficient as log Pow: 5.9

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

Effects of short-term exposure

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.
MAK: skin absorption (H); carcinogen category: 2

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in seafood. It is strongly advised not to let the chemical enter into the environment.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Do NOT take working clothes home.
This substance does not usually occur as a pure substance but as a component of polyaromatic hydrocarbon (PAH) mixtures.
Human population studies have associated PAH's exposure with cancer and cardiovascular diseases.
TLV Note: Exposure by all routes should be carefully controlled to levels as low as possible.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 45-68-50/53; S: 53-45-60-61

DI(2-ETHYLHEXYL) PHTHALATE **ICSC: 0271 (October 2001)**

Dioctylphthalate
DOP; DEHP
Bis-(2-ethylhexyl)phthalate

CAS #: 117-81-7

EC Number: 204-211-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, foam, powder, carbon dioxide.

PREVENT GENERATION OF MISTS! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal cramps. Diarrhoea. Nausea.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give one or two glasses of water to drink.

SPILLAGE DISPOSAL

Personal protection: chemical protection suit. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants, acids, alkalis and nitrates. Cool. Dry. Well closed.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

DI(2-ETHYLHEXYL) PHTHALATE **ICSC: 0271**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-LIGHT COLOURED VISCOUS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes on heating. This produces irritating fumes. Reacts with strong oxidants, acids, alkalis and nitrates.

Formula: $C_{24}H_{38}O_4$ / $C_6H_4(COOC_8H_{17})_2$
Molecular mass: 390.6
Boiling point: 385°C
Melting point: -50°C
Relative density (water = 1): 0.986
Solubility in water: none
Vapour pressure, kPa at 20°C: 0.001
Relative vapour density (air = 1): 13.45
Flash point: 215°C o.c.
Auto-ignition temperature: 350°C
Octanol/water partition coefficient as log Pow: 5.03

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes and respiratory tract.

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying.

Effects of long-term or repeated exposure
The substance may have effects on the testes. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 mg/m^3, as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: (inhalable fraction): 2 mg/m^3; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C

ENVIRONMENT

Bioaccumulation of this chemical may occur in seafood.

NOTES

ADDITIONAL INFORMATION

EC Classification
Symbol: T; R: 60-61; S: 53-45

DIBENZO(a,h)ANTHRACENE **ICSC: 0431 (November 2016)**

1,2:5,6-Dibenzanthracene

CAS #: 53-70-3
UN #: 3077
EC Number: 200-181-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	NO open flames.	Use water spray, powder.

See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE. AVOID ALL CONTACT!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest. Seek medical attention if you feel unwell.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Seek medical attention if you feel unwell.

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.

STORAGE

Well closed. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

May cause cancer
Very toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 9; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

DIBENZO(a,h)ANTHRACENE **ICSC: 0431**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS CRYSTALLINE POWDER.

Physical dangers

Chemical dangers

Formula: $C_{22}H_{14}$
Molecular mass: 278.4
Boiling point: 524°C
Melting point: 267°C
Relative density (water = 1): 1.28
Solubility in water: none
Octanol/water partition coefficient as log Pow: 6.5

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
See Notes.

Inhalation risk
A nuisance-causing concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
The substance may have effects on the skin. This may result in photosensitization. This substance is probably carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

MAK: carcinogen category: 2; germ cell mutagen group: 3A; skin absorption (H)

ENVIRONMENT

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. Bioaccumulation of this chemical may occur along the food chain. It is strongly advised not to let the chemical enter into the environment.

NOTES

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.
Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 45-50/53; S: 53-45-60-61

1 Identification

Product identifier

Product name: Dibenzofuran

Stock number: A16521, L06756
CAS Number:
132-64-9
EC number:
205-071-3
Relevant identified uses of the substance or mixture and uses advised against.
Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet
Manufacturer/Supplier:
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com
Information Department: Health, Safety and Environmental Department
Emergency telephone number:
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)
The substance is not classified according to the Globally Harmonized System (GHS).
Hazards not otherwise classified No information known.

Label elements
GHS label elements Not applicable
Hazard pictograms Not applicable
Signal word Not applicable
Hazard statements Not applicable
WHMIS classification Not controlled
Classification system
HMIS ratings (scale 0-4)
(Hazardous Materials Identification System)

Health (acute effects) = 1
Flammability = 1
Physical Hazard = 1

Other hazards
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances
CAS# Description:
132-64-9 Dibenzofuran
Identification number(s):
EC number: 205-071-3

4 First-aid measures

Description of first aid measures
After inhalation
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.
After skin contact
Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.
After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.
After swallowing Seek medical treatment.
Information for doctor
Most important symptoms and effects, both acute and delayed No further relevant information available.
Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media
Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
Special hazards arising from the substance or mixture
If this product is involved in a fire, the following can be released:
Carbon monoxide and carbon dioxide
Advice for firefighters
Protective equipment:
Wear self-contained respirator.
Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Environmental precautions: Do not allow material to be released to the environment without proper governmental permits.
Methods and material for containment and cleaning up: Pick up mechanically.
Prevention of secondary hazards: No special measures required.

(Contd. on page 2)

Product name: Dibenzofuran

(Contd. of page 1)

Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

Handling
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.
Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities
Storage
Requirements to be met by storerooms and receptacles: No special requirements.
Information about storage in one common storage facility: Store away from oxidizing agents.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters
Components with limit values that require monitoring at the workplace: Not required.
Additional information: No data

Exposure controls
Personal protective equipment
General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Maintain an ergonomically appropriate working environment.
Breathing equipment: Use suitable respirator when high concentrations are present.
Protection of hands:
Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.
Eye protection: Safety glasses
Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties
General Information

Appearance:	
Form:	Crystalline powder
Color:	White
Odor:	Not determined
Odor threshold:	Not determined.
pH-value:	Not applicable.
Change in condition	
Melting point/Melting range:	81-85 °C (178-185 °F)
Boiling point/Boiling range:	Not determined
Sublimation temperature / start:	Not determined
Flash point:	Not applicable
Flammability (solid, gaseous)	Not determined.
Ignition temperature:	Not determined
Decomposition temperature:	Not determined
Auto igniting:	Not determined.
Danger of explosion:	Product does not present an explosion hazard.
Explosion limits:	
Lower:	Not determined
Upper:	Not determined
Vapor pressure:	Not applicable.
Density at 20 °C (68 °F):	1.089 g/cm³ (9.088 lbs/gal)
Relative density	Not determined.
Vapor density	Not applicable.
Evaporation rate	Not applicable.
Solubility in / Miscibility with	
Water:	Not determined
Partition coefficient (n-octanol/water):	Not determined.
Viscosity:	
dynamic:	Not applicable.
kinematic:	Not applicable.
Other information	No further relevant information available.

10 Stability and reactivity

Reactivity No information known.
Chemical stability Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions No dangerous reactions known
Conditions to avoid No further relevant information available.
Incompatible materials: Oxidizing agents

(Contd. on page 3)

Product name: Dibenzofuran

(Contd. of page 2)

Hazardous decomposition products: Carbon monoxide and carbon dioxide

11 Toxicological information

Information on toxicological effects
Acute toxicity: No effects known.
LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: May cause irritation
Eye irritation or corrosion: May cause irritation
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: No effects known.
Carcinogenicity: No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
Reproductive toxicity: No effects known.
Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: No effects known.
Subacute to chronic toxicity: No effects known.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Ecotoxical effects:
Remark: Toxic for aquatic organisms
Additional ecological information:
General notes:
Do not allow material to be released to the environment without proper governmental permits.
Toxic for aquatic organisms
Do not allow product to reach ground water, water course or sewage system.
Danger to drinking water if even small quantities leak into the ground.
Also poisonous for fish and plankton in water bodies.
Toxic to aquatic life.
May cause long lasting harmful effects to aquatic life.
Avoid transfer into the environment.
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

UN-Number **DOT, IMDG, IATA**	UN3077
UN proper shipping name **DOT** **IMDG, IATA**	Environmentally hazardous substances, solid, n.o.s. (Dibenzofuran) ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Dibenzofuran)
Transport hazard class(es) **DOT, IMDG**  **Class** **Label** **Class** **Label** **IATA**  **Class** **Label**	 9 Miellaneous dangerous substances and articles. 9 9 (M7) Miellaneous dangerous substances and articles 9 9 Miellaneous dangerous substances and articles. 9
Packing group **DOT, IMDG, IATA**	III
Environmental hazards: **Special marking (ADR):** **Special marking (IATA):**	 Symbol (fish and tree) Symbol (fish and tree)
Special precautions for user	Warning: Miscellaneous dangerous substances and articles
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.
Transport/Additional information: **DOT** **Marine Pollutant (DOT):**	 No
UN "Model Regulation":	UN3077, Environmentally hazardous substances, solid, n.o.s. (Dibenzofuran), 9, III

(Contd. on page 4)

Product name: Dibenzofuran

(Contd. of page 3)

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture
GHS label elements Not applicable
Hazard pictograms Not applicable
Signal word Not applicable
Hazard statements Not applicable
National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Domestic Substances List (DSL).

SARA Section 313 (specific toxic chemical listings)

132-64-9	Dibenzofuran

California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use:
For use only by technically qualified individuals.
This product is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.
Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.
The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.
Substance is not listed.
Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.
Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department
Date of preparation / last revision 11/23/2015 / -
Abbreviations and acronyms:
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
vPvB: very Persistent and very Bioaccumulative
ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)

DIBUTYL PHTHALATE **ICSC: 0036 (July 2002)**

1,2-Benzenedicarboxylic acid dibutyl ester
Di-n-butyl phthalate

CAS #: 84-74-2
UN #: 3082
EC Number: 201-557-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	NO open flames.	Use foam, dry powder, carbon dioxide.

PREVENT GENERATION OF MISTS! AVOID EXPOSURE OF (PREGNANT) WOMEN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use ventilation.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in covered containers as far as possible. Absorb remaining liquid in vermiculite, sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 9; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

DIBUTYL PHTHALATE **ICSC: 0036**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-YELLOW VISCOUS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers
Decomposes on burning. This produces toxic and irritating fumes (phthalic anhydride - see ICSC 0315). Reacts with strong oxidants.

Formula: $C_{16}H_{22}O_4$ / $C_6H_4(COOC_4H_9)_2$
Molecular mass: 278.3
Boiling point: 340°C
Melting point: -35°C
Relative density (water = 1): 1.05
Solubility in water, g/100ml at 25°C: 0.001
Vapour pressure, kPa at 20°C: <0.01
Relative vapour density (air = 1): 9.58
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00
Flash point: 157°C c.c.
Auto-ignition temperature: 402°C
Explosive limits, vol% in air: 0.5-~2.5 (at 235°C)
Octanol/water partition coefficient as log Pow: 4.72

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Effects of short-term exposure

Inhalation risk
A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 mg/m^3, as TWA.
MAK: 0.58 mg/m^3, 0.05 ppm; peak limitation category: I(2); carcinogen category: 3; pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms.

NOTES

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 61-62-50; S: 53-45-61

DIETHYL PHTHALATE **ICSC: 0258 (March 2001)**

1,2-Benzenedicarboxylic acid diethyl ester
DEP

CAS #: 84-66-2

EC Number: 201-550-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use alcohol-resistant foam, powder, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Dizziness. Lethargy.	Use ventilation. Use local exhaust.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes		Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Nausea.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

DIETHYL PHTHALATE **ICSC: 0258**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS OILY LIQUID.

Physical dangers

Chemical dangers
Decomposes on heating and on burning. This produces toxic fumes and gases (phthalic anhydride - see ICSC 0315). Attacks some plastics.

Formula: $C_6H_4(COOC_2H_5)_2$ / $C_{12}H_{14}O_4$
Molecular mass: 222.3
Boiling point: 295°C
Melting point: -67 - -44°C
Relative density (water = 1): 1.1
Solubility in water at 25°C: none
Relative vapour density (air = 1): 7.7
Flash point: 117°C c.c.
Auto-ignition temperature: 457°C
Explosive limits, vol% in air: 0.7-?
Octanol/water partition coefficient as log Pow: 2.47

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure

Inhalation risk
A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 mg/m^3, as TWA; A4 (not classifiable as a human carcinogen)

ENVIRONMENT

This substance may be hazardous to the environment. Special attention should be given to fish.

NOTES

ADDITIONAL INFORMATION

EC Classification

DIMETHYL PHTHALATE **ICSC: 0261 (October 2005)**

Dimethyl 1,2-benzenedicarboxylate
Phthalic acid dimethyl ester
1,2-Benzenedicarboxylic acid, dimethyl ester
DMP

CAS #: 131-11-3

EC Number: 205-011-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	NO open flames.	Use water spray, foam, powder, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use ventilation.	Fresh air, rest.
Skin		Protective gloves.	Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL

Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Store in an area without drain or sewer access.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

DIMETHYL PHTHALATE **ICSC: 0261**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS OILY LIQUID.

Physical dangers

Chemical dangers
Decomposes on burning. This produces irritating fumes.

Formula: $C_6H_4(COOCH_3)_2$ / $C_{10}H_{10}O_4$
Molecular mass: 194.2
Boiling point: 284°C
Melting point: 5.5°C
Relative density (water = 1): 1.19
Solubility in water, g/100ml at 20°C: 0.43
Vapour pressure, Pa at 20°C: 0.8
Relative vapour density (air = 1): 6.69
Flash point: 146°C c.c.
Auto-ignition temperature: 490°C
Explosive limits, vol% in air: 0.9 (at 180°C) - 8.0 (at 109°C)
Octanol/water partition coefficient as log Pow: 1.47/2.12

EXPOSURE & HEALTH EFFECTS

Routes of exposure

Effects of short-term exposure

Inhalation risk
A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 mg/m^3, as TWA

ENVIRONMENT

The substance is harmful to aquatic organisms.

NOTES

Other melting points: ≈0°C (commercial product).

ADDITIONAL INFORMATION

EC Classification

1 Identification

Product identifier

Product name: ***Di-n-octyl phthalate***

Stock number: 41522
CAS Number:
117-84-0
EC number:
204-214-7
Relevant identified uses of the substance or mixture and uses advised against.
Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet
Manufacturer/Supplier:
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com
Information Department: Health, Safety and Environmental Department
Emergency telephone number:
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)
The substance is not classified according to the Globally Harmonized System (GHS).
Hazards not otherwise classified No information known.

Label elements
GHS label elements Not applicable
Hazard pictograms Not applicable
Signal word Not applicable
Hazard statements Not applicable
WHMIS classification Not controlled
Classification system
HMIS ratings (scale 0-4)
(Hazardous Materials Identification System)

Health (acute effects) = 1
Flammability = 1
Physical Hazard = 1

Other hazards
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances
CAS# Description:
117-84-0 Di-n-octyl phthalate
Identification number(s):
EC number: 204-214-7

4 First-aid measures

Description of first aid measures
After inhalation
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.
After skin contact
Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.
After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.
After swallowing Seek medical treatment.
Information for doctor
Most important symptoms and effects, both acute and delayed No further relevant information available.
Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media
Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
Special hazards arising from the substance or mixture
If this product is involved in a fire, the following can be released:
Carbon monoxide and carbon dioxide
Advice for firefighters
Protective equipment:
Wear self-contained respirator.
Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Environmental precautions: Do not allow product to reach sewage system or any water course.
Methods and material for containment and cleaning up: Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Prevention of secondary hazards: No special measures required.

(Contd. on page 2)

Product name: Di-n-octyl phthalate

(Contd. of page 1)

Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

Handling
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities
Storage
Requirements to be met by storerooms and receptacles: No special requirements.
Information about storage in one common storage facility: Store away from oxidizing agents.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace:	
117-84-0 Di-n-octyl phthalate (100.0%)	
EL (Canada)	Long-term value: 5 mg/m³

Additional information: No data

Exposure controls
Personal protective equipment
General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Maintain an ergonomically appropriate working environment.
Breathing equipment: Use suitable respirator when high concentrations are present.
Recommended filter device for short term use:
Use a respirator with organic vapor/acid gas cartridges as a backup to engineering controls. Risk assessment should be performed to determine if air-purifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards such as NIOSH (USA) or CEN (EU).
Protection of hands:
Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.
Material of gloves Nitrile rubber, NBR
Penetration time of glove material (in minutes) 480
Glove thickness 0.2 mm
Eye protection: Safety glasses
Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties
General Information
Appearance:

Form:	Liquid
Color:	Colorless to pale yellow
Odor:	Not determined
Odor threshold:	Not determined.
pH-value:	Not determined.
Change in condition	
Melting point/Melting range:	-25 °C (-13 °F)
Boiling point/Boiling range:	380 °C (716 °F)
Sublimation temperature / start:	Not determined
Flash point:	219 °C (426 °F)
Flammability (solid, gaseous)	Not determined.
Ignition temperature:	Not determined
Decomposition temperature:	Not determined
Auto igniting:	Not determined.
Danger of explosion:	Not determined.
Explosion limits:	
Lower:	Not determined
Upper:	Not determined
Vapor pressure at 220 °C (428 °F):	5.32 hPa (4 mm Hg)
Density at 20 °C (68 °F):	0.98 g/cm³ (8.178 lbs/gal)
Relative density	Not determined.
Vapor density	Not determined.
Evaporation rate	Not determined.
Solubility in / Miscibility with	
Water:	Not miscible or difficult to mix
Partition coefficient (n-octanol/water):	Not determined.
Viscosity:	
dynamic:	Not determined.
kinematic:	Not determined.
Other information	No further relevant information available.

(Contd. on page 3)

Product name: Di-n-octyl phthalate

(Contd. of page 2)

10 Stability and reactivity

Reactivity No information known.
Chemical stability Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions Reacts with strong oxidizing agents
Conditions to avoid No further relevant information available.
Incompatible materials: Oxidizing agents
Hazardous decomposition products: Carbon monoxide and carbon dioxide

11 Toxicological information

Information on toxicological effects
Acute toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance.
LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: May cause irritation
Eye irritation or corrosion: May cause irritation
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: No effects known.
Carcinogenicity: No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
Reproductive toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains reproductive data for this substance.
Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: No effects known.
Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Additional ecological information:
General notes: Avoid transfer into the environment.
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

UN-Number **DOT, ADN, IMDG, IATA**	Not applicable
UN proper shipping name **DOT, ADN, IMDG, IATA**	Not applicable
Transport hazard class(es)	
DOT, ADR, ADN, IMDG, IATA **Class**	Not applicable
Packing group **DOT, IMDG, IATA**	Not applicable
Environmental hazards:	Not applicable.
Special precautions for user	Not applicable.
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.
Transport/Additional information:	
DOT **Hazardous substance:** **Marine Pollutant (DOT):**	 5000 lbs, 2270 kg No
UN "Model Regulation":	-

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture
GHS label elements Not applicable
Hazard pictograms Not applicable
Signal word Not applicable
Hazard statements Not applicable
National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Domestic Substances List (DSL).
SARA Section 313 (specific toxic chemical listings) Substance is not listed.
California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use: For use only by technically qualified individuals.
Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.

(Contd. on page 4)

Product name: Di-n-octyl phthalate

(Contd. of page 3)

The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.
Substance is not listed.
Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.
Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department
Date of preparation / last revision 11/23/2015 / -
Abbreviations and acronyms:
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
DOT: US Department of Transportation
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
vPvB: very Persistent and very Bioaccumulative
ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)

1 Identification

Product identifier

Product name: Fluoranthene

Stock number: A17230
CAS Number:
206-44-0
EC number:
205-912-4
Relevant identified uses of the substance or mixture and uses advised against.
Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet
Manufacturer/Supplier:
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com
Information Department: Health, Safety and Environmental Department
Emergency telephone number:
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)

GHS06 Skull and crossbones

Acute Tox. 3 H301 Toxic if swallowed.

GHS08 Health hazard

Muta. 2 H341 Suspected of causing genetic defects.
Hazards not otherwise classified No information known.

Label elements
GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
Hazard pictograms

GHS06 GHS08

Signal word Danger
Hazard statements
H301 Toxic if swallowed.
H341 Suspected of causing genetic defects.
Precautionary statements
P281 Use personal protective equipment as required.
P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor/…
P308+P313 IF exposed or concerned: Get medical advice/attention.
P321 Specific treatment (see on this label).
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
WHMIS classification
D1B - Toxic material causing immediate and serious toxic effects
D2B - Toxic material causing other toxic effects

Classification system
HMIS ratings (scale 0-4)
(Hazardous Materials Identification System)

Health (acute effects) = 1
Flammability = 1
Physical Hazard = 1

Other hazards
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances
CAS# Description:
206-44-0 Fluoranthene
Identification number(s):
EC number: 205-912-4

4 First-aid measures

Description of first aid measures
After inhalation
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.

(Contd. on page 2)

Product name: Fluoranthene

(Contd. of page 1)

After skin contact
Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.
After eye contact *Rinse opened eye for several minutes under running water. Then consult a doctor.*
After swallowing *Seek medical treatment.*
Information for doctor
Most important symptoms and effects, both acute and delayed *No further relevant information available.*
Indication of any immediate medical attention and special treatment needed *No further relevant information available.*

5 Fire-fighting measures

Extinguishing media
Suitable extinguishing agents *Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.*
Special hazards arising from the substance or mixture
If this product is involved in a fire, the following can be released:
Carbon monoxide and carbon dioxide
Advice for firefighters
Protective equipment:
Wear self-contained respirator.
Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Environmental precautions: *Do not allow material to be released to the environment without proper governmental permits.*
Methods and material for containment and cleaning up: *Dispose of contaminated material as waste according to section 13.*
Prevention of secondary hazards: *No special measures required.*
Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

Handling
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.
Information about protection against explosions and fires: *No information known.*

Conditions for safe storage, including any incompatibilities
Storage
Requirements to be met by storerooms and receptacles: *No special requirements.*
Information about storage in one common storage facility: *Store away from oxidizing agents.*
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s) *No further relevant information available.*

8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters
Components with limit values that require monitoring at the workplace: *Not required.*
Additional information: *No data*

Exposure controls
Personal protective equipment
General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Maintain an ergonomically appropriate working environment.
Breathing equipment: *Use suitable respirator when high concentrations are present.*
Protection of hands:
Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.
Eye protection: *Safety glasses*
Body protection: *Protective work clothing.*

9 Physical and chemical properties

Information on basic physical and chemical properties
General Information
Appearance:

Form:	*Crystalline*
Color:	*Yellow*
Odor:	*Not determined*
Odor threshold:	*Not determined.*
pH-value:	*Not applicable.*
Change in condition	
Melting point/Melting range:	*107-110 °C (225-230 °F)*
Boiling point/Boiling range:	*Not determined*
Sublimation temperature / start:	*Not determined*
Flash point:	*Not applicable*
Flammability (solid, gaseous)	*Not determined.*
Ignition temperature:	*Not determined*

(Contd. on page 3)

Product name: Fluoranthene

(Contd. of page 2)

Decomposition temperature:	Not determined
Auto igniting:	Not determined.
Danger of explosion:	Product does not present an explosion hazard.
Explosion limits:	
Lower:	Not determined
Upper:	Not determined
Vapor pressure:	Not applicable.
Density:	Not determined
Relative density	Not determined.
Vapor density	Not applicable.
Evaporation rate	Not applicable.
Solubility in / Miscibility with	
Water:	Insoluble
Partition coefficient (n-octanol/water):	Not determined.
Viscosity:	
dynamic:	Not applicable.
kinematic:	Not applicable.
Other information	No further relevant information available.

10 Stability and reactivity

Reactivity No information known.
Chemical stability Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions No dangerous reactions known
Conditions to avoid No further relevant information available.
Incompatible materials: Oxidizing agents
Hazardous decomposition products: Carbon monoxide and carbon dioxide

11 Toxicological information

Information on toxicological effects
Acute toxicity: Harmful if swallowed.
LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: Irritant to skin and mucous membranes.
Eye irritation or corrosion: Irritating effect.
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: Suspected of causing genetic defects.
Carcinogenicity: No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
Reproductive toxicity: No effects known.
Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: No effects known.
Other information (about experimental toxicology):
Tumorigenic effects have been observed on tests with laboratory animals.
Mutagenic effects have been observed on tests with bacteria.
Mutagenic effects have been observed on tests with human lymphocytes.
Mutagenic effects have been observed on tests with laboratory animals.
Subacute to chronic toxicity:
The Registry of Toxic Effects of Chemical Substances (RTECS) reports the following effects in laboratory animals:
Kidney, Ureter, Bladder - changes in tubules (including acute renal failure, acute tubular necrosis).
Blood - normocytic anemia.
Blood - changes in leukocyte (WBC) count.
Skin and Appendages - tumors.
Tumorigenic - equivocal tumorigenic agent by RTECS criteria.
Tumorigenic - tumors at site of application.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Additional ecological information:
General notes:
Do not allow material to be released to the environment without proper governmental permits.
Do not allow undiluted product or large quantities to reach ground water, water course or sewage system.
Avoid transfer into the environment.
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

Not a hazardous material for transportation.

UN-Number	
DOT, IMDG, IATA	None
UN proper shipping name	
DOT, IMDG, IATA	None

(Contd. on page 4)

Product name: Fluoranthene

(Contd. of page 3)

Transport hazard class(es)	
DOT, ADR, IMDG, IATA Class	None
Packing group DOT, IMDG, IATA	None
Environmental hazards:	Not applicable.
Special precautions for user	Not applicable.
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.
Transport/Additional information:	Not dangerous according to the above specifications.
DOT	
Hazardous substance:	100 lbs, 45.4 kg
Marine Pollutant (DOT):	No

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture
GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
Hazard pictograms

GHS06 GHS08

Signal word Danger
Hazard statements
H301 Toxic if swallowed.
H341 Suspected of causing genetic defects.
Precautionary statements
P281 Use personal protective equipment as required.
P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor/…
P308+P313 IF exposed or concerned: Get medical advice/attention.
P321 Specific treatment (see on this label).
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Non-Domestic Substances List (NDSL).

SARA Section 313 (specific toxic chemical listings)	
206-44-0	Fluoranthene

California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use:
For use only by technically qualified individuals.
This product is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.
Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.
The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.
Substance is not listed.
Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.
Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department
Date of preparation / last revision 11/23/2015 / -
Abbreviations and acronyms:
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
vPvB: very Persistent and very Bioaccumulative
ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)

1 Identification

Product identifier

Product name: Fluorene

Stock number: A13871
CAS Number:
86-73-7
EC number:
201-695-5
Relevant identified uses of the substance or mixture and uses advised against.
Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet
Manufacturer/Supplier:
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com
Information Department: Health, Safety and Environmental Department
Emergency telephone number:
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)
The substance is not classified according to the Globally Harmonized System (GHS).
Hazards not otherwise classified No information known.

Label elements
GHS label elements Not applicable
Hazard pictograms Not applicable
Signal word Not applicable
Hazard statements Not applicable
WHMIS classification Not controlled
Classification system
HMIS ratings (scale 0-4)
(Hazardous Materials Identification System)

Health (acute effects) = 1
Flammability = 1
Physical Hazard = 1

Other hazards
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances
CAS# Description:
86-73-7 Fluorene
Identification number(s):
EC number: 201-695-5

4 First-aid measures

Description of first aid measures
After inhalation
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.
After skin contact
Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.
After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.
After swallowing Seek medical treatment.
Information for doctor
Most important symptoms and effects, both acute and delayed No further relevant information available.
Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media
Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
Special hazards arising from the substance or mixture
If this product is involved in a fire, the following can be released:
Carbon monoxide and carbon dioxide
Advice for firefighters
Protective equipment:
Wear self-contained respirator.
Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Environmental precautions: Do not allow material to be released to the environment without proper governmental permits.
Methods and material for containment and cleaning up: Pick up mechanically.
Prevention of secondary hazards: No special measures required.

(Contd. on page 2)

Product name: Fluorene

(Contd. of page 1)

Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

Handling
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.
Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities
Storage
Requirements to be met by storerooms and receptacles: No special requirements.
Information about storage in one common storage facility: Store away from oxidizing agents.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters
Components with limit values that require monitoring at the workplace: Not required.
Additional information: No data

Exposure controls
Personal protective equipment
General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Maintain an ergonomically appropriate working environment.
Breathing equipment: Use suitable respirator when high concentrations are present.
Protection of hands:
Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.
Penetration time of glove material (in minutes) Not determined
Eye protection: Safety glasses
Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties
General Information
Appearance:

Form:	Powder
Color:	White
Odor:	Not determined
Odor threshold:	Not determined.
pH-value:	Not applicable.
Change in condition	
Melting point/Melting range:	112-115 °C (234-239 °F)
Boiling point/Boiling range:	295 °C (563 °F)
Sublimation temperature / start:	Not determined
Flash point:	151 °C (304 °F)
Flammability (solid, gaseous)	Not determined.
Ignition temperature:	Not determined
Decomposition temperature:	Not determined
Auto igniting:	Not determined.
Danger of explosion:	Product does not present an explosion hazard.
Explosion limits:	
Lower:	Not determined
Upper:	Not determined
Vapor pressure:	Not applicable.
Density at 20 °C (68 °F):	1.202 g/cm³ (10.031 lbs/gal)
Relative density	Not determined.
Vapor density	Not applicable.
Evaporation rate	Not applicable.
Solubility in / Miscibility with	
Water:	Insoluble
Partition coefficient (n-octanol/water):	Not determined.
Viscosity:	
dynamic:	Not applicable.
kinematic:	Not applicable.
Other information	No further relevant information available.

10 Stability and reactivity

Reactivity No information known.
Chemical stability Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions No dangerous reactions known
Conditions to avoid No further relevant information available.
Incompatible materials: Oxidizing agents

(Contd. on page 3)

Product name: Fluorene

(Contd. of page 2)

Hazardous decomposition products: Carbon monoxide and carbon dioxide

11 Toxicological information

Information on toxicological effects
Acute toxicity: No effects known.
LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: Irritant to skin and mucous membranes.
Eye irritation or corrosion: Irritating effect.
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: No effects known.
Carcinogenicity: No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
Reproductive toxicity: No effects known.
Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: No effects known.
Subacute to chronic toxicity: No effects known.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Ecotoxical effects:
Remark: Very toxic for aquatic organisms
Additional ecological information:
General notes:
Do not allow product to reach ground water, water course or sewage system.
Do not allow material to be released to the environment without proper governmental permits.
Danger to drinking water if even small quantities leak into the ground.
Also poisonous for fish and plankton in water bodies.
May cause long lasting harmful effects to aquatic life.
Avoid transfer into the environment.
Very toxic for aquatic organisms
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

UN-Number **DOT, IMDG, IATA**	UN3077
UN proper shipping name **DOT** **IMDG, IATA**	Environmentally hazardous substances, solid, n.o.s. (Fluorene) ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Fluorene)
Transport hazard class(es) **DOT, IMDG**	
Class **Label** **Class** **Label** **IATA**	9 Miscellaneous dangerous substances and articles. 9 9 (M7) Miscellaneous dangerous substances and articles 9
	
Class **Label**	9 Miscellaneous dangerous substances and articles. 9
Packing group **DOT, IMDG, IATA**	III
Environmental hazards: **Special marking (ADR):** **Special marking (IATA):**	 Symbol (fish and tree) Symbol (fish and tree)
Special precautions for user	Warning: Miscellaneous dangerous substances and articles
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.
Transport/Additional information:	
DOT **Marine Pollutant (DOT):**	 No
UN "Model Regulation":	UN3077, Environmentally hazardous substances, solid, n.o.s. (Fluorene), 9, III

(Contd. on page 4)

Product name: Fluorene

(Contd. of page 3)

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture
GHS label elements Not applicable
Hazard pictograms Not applicable
Signal word Not applicable
Hazard statements Not applicable
National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Domestic Substances List (DSL).
SARA Section 313 (specific toxic chemical listings) Substance is not listed.
California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use:
For use only by technically qualified individuals.
This product is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.
Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.
The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.
Substance is not listed.
Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.
Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department
Date of preparation / last revision 11/23/2015 / -
Abbreviations and acronyms:
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
vPvB: very Persistent and very Bioaccumulative
ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)

HEXACHLOROBUTADIENE **ICSC: 0896 (August 1997)**

1,1,2,3,4,4-Hexachloro-1,3-butadiene
Perchlorobutadiene

CAS #: 87-68-3
UN #: 2279
EC Number: 201-765-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder, foam, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Burning sensation. Cough. Sore throat. Symptoms may be delayed. See Notes.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! Pain. Redness. Blisters. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Pain. Redness. Severe deep burns. Loss of vision.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Abdominal pain. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from food and feedstuffs. Well closed. Ventilation along the floor. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

Do not transport with food and feedstuffs.
Severe marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

HEXACHLOROBUTADIENE **ICSC: 0896**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes on burning. This produces toxic and corrosive fumes including hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Attacks rubber and some forms of plastic.

Formula: C_4Cl_6 / CCl_2=CClCCl=CCl_2
Molecular mass: 260.8
Boiling point: 212°C
Melting point: -18°C
Relative density (water = 1): 1.68
Solubility in water: none
Vapour pressure, Pa at 20°C: 20
Relative vapour density (air = 1): 9.0
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00
Flash point: 90°C
Auto-ignition temperature: 610°C
Octanol/water partition coefficient as log Pow: 4.90

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. The liquid is corrosive. The substance may cause effects on the kidneys.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
Repeated or prolonged contact may cause skin sensitization. May cause genetic damage in humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.02 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: 0.22 mg/m^3, 0.02 ppm; peak limitation category: II(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. The substance may cause long-term effects in the aquatic environment.

NOTES

ADDITIONAL INFORMATION

EC Classification

HEXACHLOROCYCLOPENTADIENE **ICSC: 1096 (October 2005)**

1,2,3,4,5,5-Hexachloro-1,3-cyclopentadiene
Perchlorocyclopentadiene

CAS #: 77-47-4
UN #: 2646
EC Number: 201-029-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Headache. Diarrhoea. Dizziness. Nausea. Vomiting. Laboured breathing.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain. Skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain. Blurred vision. Severe deep burns.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Burning sensation. Shock or collapse. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable plastic containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Store in an area without drain or sewer access. Dry. Well closed. Ventilation along the floor.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: I

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

HEXACHLOROCYCLOPENTADIENE **ICSC: 1096**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
OILY YELLOW-TO-GREEN LIQUID WITH PUNGENT ODOUR.

Physical dangers
The vapour is heavier than air.

Chemical dangers
Decomposes on heating. This produces toxic and corrosive fumes including hydrogen chloride and phosgene. Reacts with moist air. This produces hydrogen chloride (see ICSC 0163). Attacks many metals in the presence of water. This produces flammable/explosive gas (hydrogen - see ICSC 0001).

Formula: C_5Cl_6
Molecular mass: 272.7
Boiling point: 239°C
Melting point: -9°C
Relative density (water = 1): 1.7
Solubility in water, g/100ml at 25°C: 0.2
Vapour pressure, Pa at 20°C: 10.7
Relative vapour density (air = 1): 9.4
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00
Octanol/water partition coefficient as log Pow: 4/5

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. Inhalation may cause lung oedema. See Notes. The substance may cause effects on the kidneys and liver. This may result in tissue lesions. The effects may be delayed. Medical observation is indicated.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.01 ppm as TWA; A4 (not classifiable as a human carcinogen).
MAK skin absorption (H)

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. The substance may cause long-term effects in the aquatic environment.

NOTES

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort.
Rest and medical observation are therefore essential.
Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered.

ADDITIONAL INFORMATION

EC Classification
Symbol: T+, N; R: 22-24-26-34-50/53; S: (1/2)-25-39-45-53-60-61

HEXACHLOROETHANE **ICSC: 0051 (November 2010)**

Perchloroethane
Carbon hexachloride

CAS #: 67-72-1
UN #: 3077;(NOS)
EC Number: 200-666-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT DISPERSION OF DUST! PREVENT GENERATION OF MISTS!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety goggles.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants, alkali metals and food and feedstuffs. See Chemical Dangers. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Harmful if swallowed
May cause drowsiness or dizziness
Causes damage to the central nervous system, the kidneys and the liver through prolonged or repeated exposure
Very toxic to aquatic life

Transportation
UN Classification
UN Hazard Class: 9; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

HEXACHLOROETHANE **ICSC: 0051**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes above 300°C . This produces toxic and corrosive fumes of phosgene (see ICSC 0007) and hydrogen chloride (see ICSC 0163). Reacts with zinc, aluminium powder and sodium. Reacts violently with alkali metals and strong oxidants.

Formula: C_2Cl_6 / Cl_3CCCl_3
Molecular mass: 236.7
Sublimation point: 183-185°C
Relative density (water = 1): 2.1
Solubility in water: none
Vapour pressure, Pa at 20°C: 53
Relative vapour density (air = 1): 8.2
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0
Octanol/water partition coefficient as log Pow: 3.9

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by ingestion.

Effects of short-term exposure
The vapour is irritating to the eyes.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
The substance may have effects on the liver and kidneys. The substance may have effects on the central nervous system. This may result in ataxia and tremors. Tumours have been detected in experimental animals but may not be relevant to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: 9.8 mg/m^3, 1 ppm; skin absorption (H); peak limitation category: II(2); pregnancy risk group: C; carcinogen category: 3

ENVIRONMENT

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

Use of alcoholic beverages enhances the harmful effect.
The odour warning when the exposure limit value is exceeded is insufficient.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.

ADDITIONAL INFORMATION

EC Classification

HEXACHLOROBENZENE **ICSC: 0895 (March 1999)**

Perchlorobenzene
HCB
Pentachlorophenylchloride
Phenyl perchloryl

CAS #: 118-74-1
UN #: 2729
EC Number: 204-273-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	NO open flames.	Use water spray, foam, powder, carbon dioxide.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes		Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: chemical protection suit and particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into sealable containers. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.

STORAGE

Separated from food and feedstuffs. Well closed.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

HEXACHLOROBENZENE **ICSC: 0895**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-WHITE SOLID IN VARIOUS FORMS.

Physical dangers

Chemical dangers
Decomposes on heating. This produces toxic fumes.

Formula: C_6Cl_6
Molecular mass: 284.8
Boiling point: 323-326°C
Melting point: 231°C
Density: 1.21 g/cm³
Solubility in water, g/100ml at 20°C: 0.0000005
Vapour pressure, Pa at 20°C: 0.001
Relative vapour density (air = 1): 9.8
Flash point: 242°C c.c.
Octanol/water partition coefficient as log Pow: 5.5/6.2

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

Effects of short-term exposure

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying.

Effects of long-term or repeated exposure
The substance may have effects on the liver and nervous system. This may result in impaired functions of organs and skin lesions. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.002 mg/m^3, as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: skin absorption (H); carcinogen category: 4; pregnancy risk group: D

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in plants and fish. The substance may cause long-term effects in the aquatic environment. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 45-48/25-50/53; S: 53-45-60-61; Note: E

INDENO(1,2,3-cd)PYRENE **ICSC: 0730 (March 1999)**

o-Phenylenepyrene
2,3-Phenylenepyrene

CAS #: 193-39-5

EC Number: 205-893-2

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION			In case of fire in the surroundings, use appropriate extinguishing media.

AVOID ALL CONTACT!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.	**According to UN GHS Criteria**
STORAGE	**Transportation** **UN Classification**
Provision to contain effluent from fire extinguishing. Well closed.	
PACKAGING	

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

INDENO(1,2,3-cd)PYRENE **ICSC: 0730**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
YELLOW CRYSTALS.

Physical dangers

Chemical dangers
Upon heating, toxic fumes are formed. Decomposes on heating. This produces toxic fumes.

Formula: $C_{22}H_{12}$
Molecular mass: 276.3
Boiling point: 536°C
Melting point: 164°C
Solubility in water: none
Octanol/water partition coefficient as log Pow: 6.58

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

Effects of short-term exposure

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure
This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

MAK: skin absorption (H); carcinogen category: 2

ENVIRONMENT

This substance may be hazardous to the environment. Special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in fish.

NOTES

Indeno(1,2,3-cd)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.
ACGIH recommends environment containing Indeno(1,2,3-c,d)pyrene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m³.
Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

EC Classification

ISOPHORONE	**ICSC: 0169 (October 2000)**
1,1,3-Trimethyl-3-cyclohexene-5-one 3,5,5-Trimethylcyclohex-2-enone Isoacetophorone	
CAS #: 78-59-1 **EC Number: 201-126-0**	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Above 84°C explosive vapour/air mixtures may be formed.	NO open flames. Above 84°C use a closed system and ventilation.	Use water spray, powder, foam, carbon dioxide.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Burning sensation. Sore throat. Cough. Dizziness. Headache. Nausea. Shortness of breath.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain. Blurred vision.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Further see Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting.

SPILLAGE DISPOSAL	**CLASSIFICATION & LABELLING**
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.	**According to UN GHS Criteria** **Transportation** **UN Classification**
STORAGE	
Separated from strong oxidants, strong bases and amines.	
PACKAGING	

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

ISOPHORONE **ICSC: 0169**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Reacts with strong oxidants, strong bases and amines.

Formula: $C_9H_{14}O$
Molecular mass: 138.2
Boiling point: 215°C
Melting point: -8°C
Relative density (water = 1): 0.92
Solubility in water, g/100ml at 25°C: 1.2
Vapour pressure, Pa at 20°C: 40
Relative vapour density (air = 1): 4.8
Flash point: 84°C c.c.
Auto-ignition temperature: 460°C
Explosive limits, vol% in air: 0.8-3.8
Octanol/water partition coefficient as log Pow: 1.67

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance and the vapour are irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as STEL; A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: 11 mg/m^3, 2 ppm; peak limitation category: I(2); carcinogen category: 3; pregnancy risk group: C

ENVIRONMENT

NOTES

The occupational exposure limit value should not be exceeded during any part of the working exposure.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn; R: 21/22-36/37-40; S: (2)-13-23-36/37/39-46

NAPHTHALENE **ICSC: 0667 (June 2015)**
Naphthene

CAS #: 91-20-3
UN #: 1334 (solid) UN #: 2304 (molten)
EC Number: 202-049-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Above 80°C explosive vapour/air mixtures may be formed. Finely dispersed particles form explosive mixtures in air.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, powder, foam, carbon dioxide.

PREVENT DISPERSION OF DUST!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Headache. Weakness. Sweating. Nausea. Vomiting. Further see Ingestion.	Use ventilation (not if powder), local exhaust or breathing protection.	Fresh air. Refer for medical attention.
Skin	See Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Seek medical attention if you feel unwell.
Eyes	Redness.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Abdominal pain. Diarrhoea. Sweating. Headache. Fever. Jaundice. Weakness. Dark-coloured urine. Symptoms may be delayed.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants and food and feedstuffs. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

Flammable solid
Harmful if swallowed
May be harmful in contact with skin
Suspected of causing cancer
Very toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 4.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

NAPHTHALENE **ICSC: 0667**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
WHITE SOLID IN VARIOUS FORMS WITH CHARACTERISTIC ODOUR.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
On combustion, forms irritating and toxic gases. Reacts with strong oxidants. This generates fire and explosion hazard.

Formula: $C_{10}H_8$
Molecular mass: 128.18
Boiling point: 218°C
Sublimes at room temperature
Melting point: 80°C
Density: 1.16 g/cm³
Solubility in water at 20°C: very poor
Vapour pressure, Pa at 25°C: 11
Relative vapour density (air = 1): 4.42
Flash point: 80°C c.c.
Auto-ignition temperature: 540°C
Explosive limits, vol% in air: 0.9-5.9
Octanol/water partition coefficient as log Pow: 3.35

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance may cause effects on the blood. This may result in lesions of blood cells (haemolysis). See Notes. The effects may be delayed. Ingestion could cause death. Medical observation is indicated.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance may have effects on the blood. This may result in chronic haemolytic anaemia. The substance may have effects on the eyes. This may result in development of cataract. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
EU-OEL: 50 mg/m^3, 10 ppm as TWA.
MAK: skin absorption (H); carcinogen category: 2; germ cell mutagen group: 3B

ENVIRONMENT

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. Bioaccumulation of this chemical may occur along the food chain, for example in fish.

NOTES

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 22-40-50/53; S: (1/2)-26-36/37/39-45-46-60-61

NITROBENZENE	ICSC: 0065 (April 2006)
CAS #: 98-95-3 **UN #: 1662** **EC Number: 202-716-0**	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Above 88°C explosive vapour/air mixtures may be formed. Risk of fire and explosion. See Chemical Dangers.	NO open flames. Above 88°C use a closed system and ventilation.	Use water spray, alcohol-resistant foam, dry powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Headache. Blue lips, fingernails and skin. Blue lips, fingernails and skin. Dizziness. Nausea. Weakness. Confusion. Convulsions. Unconsciousness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes		Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Rest. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from combustible substances, reducing agents, strong oxidants, strong acids and food and feedstuffs. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Harmful if swallowed
Toxic in contact with skin or if inhaled
Suspected of causing cancer
Suspected of damaging fertility or the unborn child
May cause damage to blood cells
Harmful to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

NITROBENZENE **ICSC: 0065**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
PALE YELLOW OILY LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
On combustion, forms toxic and corrosive fumes including nitrogen oxides. Reacts violently with strong oxidants and reducing agents. This generates fire and explosion hazard. Reacts violently with strong acids and nitrogen oxides. This generates explosion hazard.

Formula: $C_6H_5NO_2$
Molecular mass: 123.1
Boiling point: 211°C
Melting point: 5°C
Relative density (water = 1): 1.2
Solubility in water, g/100ml: 0.2
Vapour pressure, Pa at 20°C: 20
Relative vapour density (air = 1): 4.2
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00
Flash point: 88°C c.c.
Auto-ignition temperature: 480°C
Explosive limits, vol% in air: 1.8-40
Octanol/water partition coefficient as log Pow: 1.86

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance may cause effects on the blood. This may result in the formation of methaemoglobin. Exposure could cause lowering of consciousness. The effects may be delayed. Medical observation is indicated.

Inhalation risk
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C; on spraying or dispersing, however, much faster.

Effects of long-term or repeated exposure
The substance may have effects on the blood, spleen and liver. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: 0.51 mg/m^3, 0.1 ppm; peak limitation category: II(4); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.
EU-OEL: 1 mg/m^3, 0.2 ppm as TWA; (skin)

ENVIRONMENT

The substance is harmful to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

Use of alcoholic beverages enhances the harmful effect.
Depending on the degree of exposure, periodic medical examination is suggested.
Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.
Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 23/24/25-40-48/23/24-51/53-62; S: (1/2)-28-36/37-45-61

N-NITROSODIMETHYLAMINE **ICSC: 0525 (March 2001)**

Dimethylnitrosamine
N-Methyl-N-nitrosomethylamine
DMN

CAS #: 62-75-9
UN #: 2810
EC Number: 200-549-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible.	NO open flames.	Use powder, carbon dioxide.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Cough. Nausea. Diarrhoea. Vomiting. Headache. Weakness.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness. Pain.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Pain. Redness.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal cramps. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Give a slurry of activated charcoal in water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Evacuate danger area! Personal protection: chemical protection suit including self-contained breathing apparatus. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants and food and feedstuffs. Cool. Keep in the dark. Well closed.

PACKAGING

Do not transport with food and feedstuffs.
Unbreakable packaging.
Put breakable packaging into closed unbreakable container.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: I

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

N-NITROSODIMETHYLAMINE **ICSC: 0525**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
YELLOW OILY LIQUID.

Physical dangers

Chemical dangers
Decomposes on heating. This produces nitrogen oxides. Reacts with strong oxidants and strong bases.

Formula: $C_2H_6N_2O$ / $(CH_3)_2NN=O$
Molecular mass: 74.1
Boiling point: 151°C
Relative density (water = 1): 1.0
Solubility in water: very good
Vapour pressure, Pa at 20°C: 360
Relative vapour density (air = 1): 2.56
Flash point: 61°C
Octanol/water partition coefficient as log Pow: -0.57

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the liver. This may result in jaundice. The effects may be delayed. See Notes. Medical observation is indicated.

Inhalation risk
No indication can be given about the rate at which a harmful concentration of this substance in the air is reached on evaporation at 20°C.

Effects of long-term or repeated exposure
The substance may have effects on the liver. This may result in liver function impairment and cirrhosis. This substance is probably carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: skin absorption (H); carcinogen category: 2

ENVIRONMENT

Environmental effects from the substance have not been investigated adequately.

NOTES

The symptoms of jaundice do not become manifest until some hours have passed.
TLV Note: Exposure by all routes should be carefully controlled to levels as low as possible.

ADDITIONAL INFORMATION

EC Classification
Symbol: T+, N; R: 45-25-26-48/25-51/53; S: 53-45-61; Note: E

TCI AMERICA

SAFETY DATA SHEET

Revision number: 3
Revision date: 10/17/2016

1. IDENTIFICATION

Product name: N-Nitrosodipropylamine
Product code: N0444

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborgate Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:
Acute Toxicity - Oral [Category 4]
Germ Cell Mutagenicity [Category 2]
Carcinogenicity [Category 2]
Toxic to Reproduction [Category 2]
Specific Target Organ Toxicity (Single Exposure) [Category 2]
Aquatic Hazard (Acute) [Category 2]
Aquatic Hazard (Long-Term) [Category 2]

Signal word: Warning!

Hazard Statement(s):
Harmful if swallowed
Suspected of causing cancer
Suspected of causing genetic defects
Suspected of damaging fertility or the unborn child
Toxic to aquatic life
Toxic to aquatic life with long lasting effects
May cause damage to organs: Liver

Pictogram(s) or Symbol(s):

Precautionary Statement(s):

[Prevention] Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves, protective clothing, eye protection and face protection. Do not breathe fume, mist, vapors or spray. Wash all exposed skin thoroughly after handling.

[Response] If swallowed: Immediately call a poison center or doctor. Rinse mouth. If exposed: Call a poison center or doctor. If exposed or concerned: Get medical advice or attention. If exposed or concerned: Call a poison center or doctor.

[Storage] Store locked up.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

2. HAZARD(S) IDENTIFICATION

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture:	Substance
Components:	N-Nitrosodipropylamine
Percent:	>98.0%(GC)
CAS Number:	621-64-7
Molecular Weight:	130.19
Chemical Formula:	$C_6H_{14}N_2O$
Synonyms:	Dipropylnitrosamine

4. FIRST-AID MEASURES

Inhalation: Call emergency medical service. Effects of exposure (inhalation) to substance may be delayed. Inhalation of vapors or contact with substance will result in contamination and potential harmful effects. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact: Call a poison center or doctor if you feel unwell. Effects of exposure (skin contact) to substance may be delayed. Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Eye contact: If this chemical contacts the eyes, immediately wash (irrigate) the eyes with large amounts of water, occasionally lifting the lower and upper eyelids. If eye irritation persists get medical advice/attention. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Harmful if swallowed. Effects of exposure (ingestion) to substance may be delayed. If swallowed, seek medical advice immediately and show the container or label. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: No data available

Delayed: May cause heritable genetic damage in humans. Possibly carcinogenic to humans.

Immediate medical attention: WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is harmful. CAUTION: Victim may be a source of contamination. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO_2 , water spray, or alcohol-resistant foam. Consult with local fire authorities before attempting large scale fire fighting operations.

Specific hazards arising from the chemical

Hazardous combustion products: These products include: Carbon oxides Nitrogen oxides

Other specific hazards: Closed containers may explode from heat of a fire.

Special precautions for fire-fighters:

Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.

Special protective equipment for fire-fighters:

Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Splash goggles. Wear protective clothing (chemical resistant suit and chemical resistant boots). Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

Emergency procedures: Do not clean-up or dispose except under supervision of a specialist. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:
ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material. Ventilate the area.

Environmental precautions:
Keep away from living quarters. Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Do NOT breath gas, fumes, vapor, or spray. Manipulate under an adequate fume hood. Do not ingest. Avoid contact with skin and eyes. Avoid contact - obtain special instructions before use. Avoid prolonged or repeated exposure. Normal measures for preventive fire protection. Avoid exposure - obtain special instructions before use. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Store locked up. Keep containers tightly closed in a cool, well-ventilated place. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

Appropriate engineering controls:
Handle only in a fully enclosed system and equipment. Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection: Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection: Wear protective gloves.
Eye protection: Splash goggles.
Skin and body protection: Wear protective clothing (chemical resistant suit and chemical resistant boots).

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid
Form: Clear
Color: Pale yellow - Yellow
Odor: No data available
Odor threshold: No data available

Melting point/freezing point:	No data available	**pH:**	No data available
Boiling point/range:	113°C (235°F)/5.3kPa	**Vapor pressure:**	0.01kPa/20°C
Decomposition temperature:	No data available	**Vapor density:**	No data available
Relative density:	0.92	**Dynamic Viscosity:**	No data available
Kinematic Viscosity:	No data available		
Partition coefficient: n-octanol/water (log P_{ow})	1.36	**Evaporation rate:** (Butyl Acetate = 1)	No data available

9. PHYSICAL AND CHEMICAL PROPERTIES

Flash point: 100°C (212°F)
Autoignition temperature: No data available
Flammability (solid, gas): No data available
Flammability or explosive limits:
Lower: No data available
Upper: No data available

Solubility(ies):
Water: Soluble
Soluble: Many organic solvents

10. STABILITY AND REACTIVITY

Reactivity: Not Available.
Chemical Stability: Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions: No hazardous reactivity has been reported.
Conditions to avoid: Avoid excessive heat and light.
Incompatible materials: Oxidizing agents
Hazardous Decomposition Products: No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: JL9700000

Acute Toxicity:
orl-rat LD50:480 mg/kg
scu-rat LD50:487 mg/kg

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
dnd-hmn-kdy 10 mmol/L
dns-hmn-hla 100 umol/L

dns-hmn-lvr 1800 umol/L

Carcinogenicity:

orl-rat TDLo:660 mg/kg/60W-I
scu-ham TD:143 mg/kg/38W-I

IARC: Group 2B (Possibly carcinogenic to humans) .
NTP: b (Reasonably anticipated to be carcinogens).
OSHA: No data available

Reproductive toxicity:
No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.
Symptoms related to exposure:
Overexposure may result in serious illness or death.
Potential Health Effects:
No specific information available; skin and eye contact may result in irriatation. May be harmful if inhaled or ingested.
Target organ(s):
May cause damage to organs: Liver

12. ECOLOGICAL INFORMATION

Ecotoxicity
Fish: No data available
Crustacea: No data available
Algae: No data available

12. ECOLOGICAL INFORMATION

Persistence and degradability:	No data available
Bioaccumulative potential (BCF):	6
Mobillity in soil:	No data available
Partition coefficient: n-octanol/water (log P_{ow})	1.36
Soil adsorption (Koc):	130
Henry's Law: constant (PaM^3/mol)	0.5

13. DISPOSAL CONSIDERATIONS

Disposal of product:	Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.
Disposal of container:	Dispose of as unused product. Do not re-use empty containers.
Other considerations:	Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3082	Environmentally hazardous substance, liquid, n.o.s.	9 Miscellaneous hazardous material	III

IATA

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3082	Environmentally hazardous substance, liquid, n.o.s.	9 Miscellaneous hazardous material	III

IMDG

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3082	Environmentally hazardous substance, liquid, n.o.s.	9 Miscellaneous hazardous material	III

EmS number: F-A, S-F

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):
This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313:	Listed
SARA 302:	Not Listed

State Regulations

State Right-to-Know

Massachusetts	Listed
New Jersey	Not Listed
Pennsylvania	Listed
California Proposition 65:	Listed

Other Information

NFPA Rating:

Health:	2
Flammability:	1
Instability:	0

HMIS Classification:

Health:	2
Flammability:	1
Physical:	0

15. REGULATORY INFORMATION

International Inventories

WHMIS hazard class:	D2A: Materials causing other toxic effects. (Very Toxic) D2B: Materials causing other toxic effects. (Toxic)
EC-No:	210-698-0

16. OTHER INFORMATION

Revision date: 10/17/2016
Revision number: 3

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

N-NITROSODIPHENYLAMINE **ICSC: 0526 (November 2003)**

Diphenylnitrosamine
N-Nitroso-N-phenyl benzenamine
N-nitroso-N-phenylaniline
Nitrous diphenylamide

CAS #: 86-30-6

EC Number: 201-663-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use foam, powder, carbon dioxide.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting.	**According to UN GHS Criteria**
STORAGE	**Transportation**
Separated from strong oxidants. Store in an area without drain or sewer access.	**UN Classification**
PACKAGING	

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

N-NITROSODIPHENYLAMINE **ICSC: 0526**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
YELLOW FLAKES.

Physical dangers

Chemical dangers
Decomposes on burning. This produces nitrogen oxides. Reacts vigorously with oxidants.

Formula: $C_{12}H_{10}N_2O$
Molecular mass: 198.2
Boiling point: 101°C
Melting point: 66.5°C
Density: 1.23 g/cm³
Solubility in water: none
Octanol/water partition coefficient as log Pow: 2.57/3.13

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by ingestion.

Effects of short-term exposure

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

MAK: carcinogen category: 3

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. It is strongly advised not to let the chemical enter into the environment.

NOTES

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

EC Classification

PENTACHLOROPHENOL	ICSC: 0069 (August 2003)

CAS #: 87-86-5
UN #: 3155
EC Number: 201-778-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Liquid formulations containing organic solvents may be flammable.		In case of fire in the surroundings, use appropriate extinguishing media.

PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN! AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Dizziness. Drowsiness. Headache. Fever. Laboured breathing. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness. Blisters. Further see Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention . Wear protective gloves when administering first aid.
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal cramps. Diarrhoea. Nausea. Unconsciousness. Vomiting. Weakness. Further see Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: chemical protection suit and filter respirator for organic gases and particulates adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from strong oxidants and food and feedstuffs. Keep in a well-ventilated room.

PACKAGING

Do not transport with food and feedstuffs.
Severe marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

PENTACHLOROPHENOL **ICSC: 0069**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
WHITE CRYSTALS OR SOLID IN VARIOUS FORMS WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes above 200°C . This produces toxic and corrosive fumes including dioxins. Reacts violently with strong oxidants.

Formula: C_6Cl_5OH
Molecular mass: 266.4
Decomposes at 309°C
Melting point: 191°C
Density: 1.98 g/cm³
Solubility in water, g/100ml at 20°C: 0.001
Vapour pressure, Pa at 20°C: 0.02
Relative vapour density (air = 1): 9.2
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.00
Octanol/water partition coefficient as log Pow: 5.01

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract. The substance may cause effects on the cardiovascular system. This may result in cardiac disorders and heart failure.

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

Effects of long-term or repeated exposure
The substance may have effects on the central nervous system, kidneys, liver, lungs, immune system and thyroid. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.5 mg/m^3, as TWA; 1 mg/m^3 as STEL; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.
MAK: skin absorption (H); carcinogen category: 2

ENVIRONMENT

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

The commercial product may contain very toxic impurities (dioxins).
The odour warning when the exposure limit value is exceeded is insufficient.

ADDITIONAL INFORMATION

EC Classification
Symbol: T+, N; R: 24/25-26-36/37/38-40-50/53; S: (1/2)-22-36/37-45-52-60-61

1 Identification

Product identifier

Product name: Phenanthrene

Stock number: L01921
CAS Number:
85-01-8
EC number:
201-581-5
Relevant identified uses of the substance or mixture and uses advised against.
Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet
Manufacturer/Supplier:
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com
Information Department: Health, Safety and Environmental Department
Emergency telephone number:
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)


GHS07

Acute Tox. 4 H302 Harmful if swallowed.
Hazards not otherwise classified No information known.

Label elements
GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
Hazard pictograms


GHS07

Signal word Warning
Hazard statements
H302 Harmful if swallowed.
Precautionary statements
P264 Wash thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P301+P312 IF SWALLOWED: Call a POISON CENTER/doctor/…/if you feel unwell.
P330 Rinse mouth.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
WHMIS classification Not controlled
Classification system
HMIS ratings (scale 0-4)
(Hazardous Materials Identification System)

Health (acute effects) = 1
Flammability = 1
Physical Hazard = 1

Other hazards
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances
CAS# Description:
85-01-8 Phenanthrene
Identification number(s):
EC number: 201-581-5

4 First-aid measures

Description of first aid measures
After inhalation
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.
After skin contact
Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.
After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.
After swallowing Seek medical treatment.
Information for doctor
Most important symptoms and effects, both acute and delayed No further relevant information available.
Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media
Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

(Contd. on page 2)

Product name: Phenanthrene

(Contd. of page 1)

Special hazards arising from the substance or mixture
If this product is involved in a fire, the following can be released:
Carbon monoxide and carbon dioxide
Advice for firefighters
Protective equipment:
Wear self-contained respirator.
Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Environmental precautions: *Do not allow product to reach sewage system or any water course.*
Methods and material for containment and cleaning up: *Dispose of contaminated material as waste according to section 13.*
Prevention of secondary hazards: *No special measures required.*
Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

Handling
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.
Information about protection against explosions and fires: *No information known.*

Conditions for safe storage, including any incompatibilities
Storage
Requirements to be met by storerooms and receptacles: *No special requirements.*
Information about storage in one common storage facility: *Store away from oxidizing agents.*
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s) *No further relevant information available.*

8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters
Components with limit values that require monitoring at the workplace:
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.
Additional information: *No data*

Exposure controls
Personal protective equipment
General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Maintain an ergonomically appropriate working environment.
Breathing equipment: *Use suitable respirator when high concentrations are present.*
Recommended filter device for short term use:
Use a respirator with type N95 (USA) or PE (EN 143) cartridges as a backup to engineering controls. Risk assessment should be performed to determine if air-purifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards.
Protection of hands:
Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.
Material of gloves *Nitrile rubber, NBR*
Penetration time of glove material (in minutes) *480*
Glove thickness *0.11 mm*
Eye protection: *Safety glasses*
Body protection: *Protective work clothing.*

9 Physical and chemical properties

Information on basic physical and chemical properties
General Information
Appearance:

Form:	*Crystalline powder or flakes*
Color:	*White to pale brown*
Odor:	*Not determined*
Odor threshold:	*Not determined.*
pH-value:	*Not applicable.*
Change in condition	
Melting point/Melting range:	*97-101 °C (207-214 °F)*
Boiling point/Boiling range:	*340 °C (644 °F)*
Sublimation temperature / start:	*Not determined*
Flash point:	*171 °C (340 °F)*
Flammability (solid, gaseous)	*Not determined.*
Ignition temperature:	*Not determined*
Decomposition temperature:	*Not determined*
Auto igniting:	*Not determined.*
Danger of explosion:	*Not determined.*
Explosion limits:	
Lower:	*Not determined*

(Contd. on page 3)

Product name: Phenanthrene

(Contd. of page 2)

Upper:	Not determined
Vapor pressure:	Not applicable.
Density at 20 °C (68 °F):	0.98 g/cm³ (8.178 lbs/gal)
Relative density	Not determined.
Vapor density	Not applicable.
Evaporation rate	Not applicable.
Solubility in / Miscibility with	
Water:	Insoluble
Partition coefficient (n-octanol/water):	Not determined.
Viscosity:	
dynamic:	Not applicable.
kinematic:	Not applicable.
Other information	No further relevant information available.

10 Stability and reactivity

Reactivity No information known.
Chemical stability Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions Reacts with strong oxidizing agents
Conditions to avoid No further relevant information available.
Incompatible materials: Oxidizing agents
Hazardous decomposition products: Carbon monoxide and carbon dioxide

11 Toxicological information

Information on toxicological effects
Acute toxicity:
Harmful if swallowed.
The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance.

LD/LC50 values that are relevant for classification:

Oral	LD50	1800 mg/kg (rat)

Skin irritation or corrosion: May cause irritation
Eye irritation or corrosion: May cause irritation
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains mutation data for this substance.
Carcinogenicity:
The Registry of Toxic Effects of Chemical Substances (RTECS) contains tumorigenic and/or carcinogenic and/or neoplastic data for this substance.
No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
Reproductive toxicity: No effects known.
Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: No effects known.
Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Ecotoxical effects:
Remark: Very toxic for aquatic organisms
Additional ecological information:
General notes:
Do not allow product to reach ground water, water course or sewage system, even in small quantities.
Danger to drinking water if even extremely small quantities leak into the ground.
Also poisonous for fish and plankton in water bodies.
May cause long lasting harmful effects to aquatic life.
Avoid transfer into the environment.
Very toxic for aquatic organisms
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

UN-Number	
DOT, IMDG, IATA	UN3077
UN proper shipping name	
DOT	Environmentally hazardous substances, solid, n.o.s. (Phenanthrene)
IMDG, IATA	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Phenanthrene)
Transport hazard class(es)	
DOT, IMDG	
Class	9 Miscellaneous dangerous substances and articles.

(Contd. on page 4)

Product name: Phenanthrene

(Contd. of page 3)

Label	9
Class	9 (M7) Miscellaneous dangerous substances and articles
Label	9
IATA	

Class	9 Miscellaneous dangerous substances and articles.
Label	9
Packing group	
DOT, IMDG, IATA	III
Environmental hazards:	
Special marking (ADR):	Symbol (fish and tree)
Special marking (IATA):	Symbol (fish and tree)
Special precautions for user	Warning: Miscellaneous dangerous substances and articles
EMS Number:	F-A,S-F
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.
Transport/Additional information:	
DOT	
Marine Pollutant (DOT):	No
UN "Model Regulation":	UN3077, Environmentally hazardous substances, solid, n.o.s. (Phenanthrene), 9, III

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture
GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
Hazard pictograms

GHS07

Signal word Warning
Hazard statements
H302 Harmful if swallowed.
Precautionary statements
P264 Wash thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P301+P312 IF SWALLOWED: Call a POISON CENTER/doctor/…/if you feel unwell.
P330 Rinse mouth.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Domestic Substances List (DSL).

SARA Section 313 (specific toxic chemical listings)

85-01-8	Phenanthrene

California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use: For use only by technically qualified individuals.
Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.
The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.
Substance is not listed.
Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.
Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department
Date of preparation / last revision 11/23/2015 / -
Abbreviations and acronyms:
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
vPvB: very Persistent and very Bioaccumulative
ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)

PHENOL **ICSC: 0070 (April 2017)**

Carbolic acid
Phenic acid
Hydroxybenzene

CAS #: 108-95-2
UN #: 1671
EC Number: 203-632-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Above 79°C explosive vapour/air mixtures may be formed.	NO open flames. NO contact with strong oxidizing agents. Above 79°C use a closed system and ventilation.	Use water spray, alcohol-resistant foam, powder, carbon dioxide.

AVOID ALL CONTACT! FIRST AID: USE PERSONAL PROTECTION. IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Burning sensation. Cough. Dizziness. Headache. Shortness of breath. Laboured breathing. Unconsciousness. Symptoms may be delayed. See Notes.	Avoid inhalation of dust and mist. Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Half-upright position. Refer for medical attention.
Skin	MAY BE ABSORBED! Serious skin burns. Numbness. Convulsions. Collapse. Unconsciousness.	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. Rinse skin with plenty of water or shower. To remove substance use polyethylene glycol 300 or vegetable oil. Refer immediately for medical attention .
Eyes	Pain. Redness. Loss of vision. Severe burns.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Sore throat. Burns in mouth and throat. Convulsions. Abdominal pain. Diarrhoea. Shock or collapse.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give one or two glasses of water to drink. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from strong oxidants and food and feedstuffs. Dry. Well closed. Store only in original container. Keep in a well-ventilated room. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Toxic if swallowed or in contact with skin
Causes severe skin burns and eye damage
Suspected of causing genetic defects
Causes damage to central nervous system, the heart and kidneys
Causes damage to organs through prolonged or repeated exposure
May cause respiratory irritation
Toxic to aquatic life

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.


International Labour Organization
World Health Organization


European Commission

PHENOL **ICSC: 0070**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-YELLOW OR LIGHT PINK CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
The solution in water is a weak acid. Reacts with oxidants. This generates fire and explosion hazard.

Formula: C_6H_6O / C_6H_5OH
Molecular mass: 94.1
Boiling point: 182°C
Melting point: 41°C
Density: 1.06 g/cm³
Solubility in water, g/l at 20°C: 84 (moderate)
Vapour pressure, Pa at 20°C: 47
Relative vapour density (air = 1): 3.2
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.0
Flash point: 79°C c.c.
Auto-ignition temperature: 715°C
Explosive limits, vol% in air: 1.3-9.5
Octanol/water partition coefficient as log Pow: 1.46

EXPOSURE & HEALTH EFFECTS

Routes of exposure
Serious local effects by all routes of exposure.

Effects of short-term exposure
The substance and the vapour are corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. Inhalation of the vapour may cause lung oedema, but only after initial corrosive effects on eyes and/or airways have become manifest. See Notes. The substance may cause effects on the central nervous system, heart and kidneys. This may result in convulsions, coma, cardiac disorders, respiratory failure and collapse. The effects may be delayed. Medical observation is indicated. Exposure could cause death.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

Effects of long-term or repeated exposure
The substance may have effects on the liver, kidneys and nervous system.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 5 ppm as TWA; (skin); A4 (not classifiable as a human carcinogen); BEI issued.
MAK: skin absorption (H); carcinogen category: 3; germ cell mutagen group: 3B.
EU-OEL: 8 mg/m^3, 2 ppm as TWA; 16 mg/m^3, 4 ppm as STEL; (skin)

ENVIRONMENT

The substance is toxic to aquatic organisms.

NOTES

Other UN numbers: 2312 (molten); 2821 (solution).
Depending on the degree of exposure, periodic medical examination is suggested.
The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, C, Xn; R: 23/24/25-34-48/20/21/22-68; S: (1/2)-24/25-26-28-36/37/39-45

PYRENE **ICSC: 1474 (November 2003)**

Benzo (d,e,f) phenanthrene
beta-Pyrene

CAS #: 129-00-0

EC Number: 204-927-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks and NO smoking.	Use water spray, carbon dioxide, dry powder, alcohol-resistant foam, polymer foam.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Avoid inhalation of dust.	Fresh air, rest.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Do NOT induce vomiting. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder.

STORAGE

Separated from strong oxidants. Keep in a well-ventilated room.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

PYRENE **ICSC: 1474**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
PALE YELLOW OR COLOURLESS SOLID IN VARIOUS FORMS.

Physical dangers

Chemical dangers
Decomposes on heating. This produces irritating fumes.

Formula: $C_{16}H_{10}$
Molecular mass: 202.26
Boiling point: 404°C
Melting point: 151°C
Density: 1.27 g/cm³
Solubility in water, mg/l at 25°C: 0.135
Vapour pressure, Pa at ?°C: 0.08
Octanol/water partition coefficient as log Pow: 4.88

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
Exposure to sun may enhance the irritating effect of this substance. This may result in chronic skin discoloration.

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

MAK skin absorption (H)

ENVIRONMENT

Bioaccumulation of this chemical may occur in crustacea, fish, milk, algae and molluscs. It is strongly advised not to let the chemical enter into the environment.

NOTES

Pyrene is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles.
However, pyrene may be encountered as a laboratory chemical in its pure form.
Health effects of exposure to the substance have not been investigated adequately.
See ICSC 1415.

ADDITIONAL INFORMATION

EC Classification

ALUMINIUM POWDER (pyrophoric) **ICSC: 0988 (November 2019)**

Aluminum powder

CAS #: 7429-90-5
UN #: 1396 (uncoated)
EC Number: 231-072-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Forms flammable gas on contact with water or damp air. Finely dispersed particles form explosive mixtures in air. Risk of fire and explosion on contact with acids, alcohol, oxidizing agents or water.	NO contact with acids, alcohol, oxidizing agents or water. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use dry sand, special powder. NO water. NO carbon dioxide, foam.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Rinse skin with plenty of water or shower.
Eyes	Redness.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered dry containers.

STORAGE

Separated from strong oxidants, strong bases, strong acids, water and halogens. See Chemical Dangers. Dry. Well closed.

PACKAGING

Airtight.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Catches fire spontaneously if exposed to air
In contact with water releases flammable gases

Transportation
UN Classification
UN Hazard Class: 4.3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

ALUMINIUM POWDER (pyrophoric) **ICSC: 0988**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
SILVERY-WHITE-TO-GREY POWDER.

Physical dangers
Ignites in air when finely divided. Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
Reacts with water and alcohols. Reacts violently with oxidants, strong acids, strong bases, chlorinated hydrocarbons and halogens. This generates fire and explosion hazard.

Formula: Al
Atomic mass: 27.0
Boiling point: 2327°C
Melting point: 660°C
Density: 2.7 g/cm³
Solubility in water: reaction
Auto-ignition temperature: 400°C (powder)

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation.

Effects of short-term exposure

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure
Repeated or prolonged inhalation of dust particles may cause effects on the lungs. The substance may have effects on the nervous system. This may result in impaired functions.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1 mg/m^3, as TWA; A4 (not classifiable as a human carcinogen).
MAK: (inhalable fraction): 4 mg/m^3; (respirable fraction): 1.5 mg/m^3; pregnancy risk group: D

ENVIRONMENT

NOTES

Other UN number: UN1309 Aluminium powder, coated, Hazard class 4.1, Pack group II.

ADDITIONAL INFORMATION

EC Classification
H250; H261 / H228; H261

ANTIMONY **ICSC: 0775 (October 2006)**

Antimony black
Antimony regulus
Stibium

CAS #: 7440-36-0
UN #: 2871
EC Number: 231-146-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air. Risk of fire and explosion on contact with acids or halogens.	NO open flames. NO contact with oxidizing agents, halogens or acids. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use water spray, foam, powder, carbon dioxide.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Cough. See Ingestion.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Vomiting. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting.

STORAGE

Separated from oxidants, acids, halogens and food and feedstuffs.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

ANTIMONY **ICSC: 0775**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
SILVER-WHITE LUSTROUS HARD BRITTLE LUMPS OR DARK GREY POWDER.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
On combustion, forms toxic fumes of antimony oxides (see ICSC 0012). Reacts violently with oxidants, acids, halogens and powdered metals. This generates fire and explosion hazard. Contact with acids may generate toxic gas (stibine - see ICSC 0776).

Formula: Sb
Atomic mass: 121.8
Boiling point: 1635 °C
Melting point: 630 °C
Density: 6.7 g/cm³
Solubility in water: none

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol.

Effects of short-term exposure
May cause mechanical irritation to the eyes.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis especially when the skin is exposed to fumes. The substance may have effects on the lungs. This may result in pneumoconiosis.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.5 mg/m^3, as TWA.
MAK: (including its inorganic compounds, except stibine): carcinogen category: 2; germ cell mutagen group: 3A

ENVIRONMENT

NOTES

Other boiling points: 1325°C, 1440°C, 1587 °C, 1750°C.
The recommendations on this card apply only to metallic antimony.
See ICSCs 0012, 0220, 0776 and 1224.

ADDITIONAL INFORMATION

EC Classification

ARSENIC **ICSC: 0013 (June 2011)**

Grey arsenic

CAS #: 7440-38-2
UN #: 1558
EC Number: 231-148-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with incompatible substances. See Chemical Dangers.	NO open flames. NO contact with strong oxidizing agents. NO contact with hot surfaces. NO contact with incompatible materials: See Notes.	Use water spray, powder, foam, carbon dioxide.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	See Ingestion.	Use closed system and ventilation.	Fresh air, rest. Seek medical attention if you feel unwell.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear face shield or eye protection in combination with breathing protection if powder.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Abdominal pain. Diarrhoea. Nausea. Vomiting. Weakness. Shock or collapse. Unconsciousness.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants, acids, halogens and food and feedstuffs. Well closed. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Toxic if swallowed
May cause cancer
Suspected of damaging fertility or the unborn child
Causes damage to the gastrointestinal tract if swallowed
Causes damage to organs through prolonged or repeated exposure
Toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

ARSENIC **ICSC: 0013**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
BRITTLE GREY METALLIC-LOOKING CRYSTALS.

Physical dangers
No data.

Chemical dangers
Upon heating, toxic fumes are formed. Reacts violently with strong oxidants and halogens. This generates fire and explosion hazard. Reacts with reducing agents. This produces toxic and flammable arsine gas (See ICSC 0222).

Formula: As
Atomic mass: 74.9
Sublimation point: 613°C
Density: 5.7 g/cm³
Solubility in water: none
Auto-ignition temperature: 180°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Effects of short-term exposure
The substance may cause effects on the gastrointestinal tract. This may result in severe gastroenteritis, loss of fluids and electrolytes, cardiac disorders, shock and convulsions. Exposure far above the OEL could cause death. The effects may be delayed. Medical observation is indicated.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

Effects of long-term or repeated exposure
The substance may have effects on the skin, mucous membranes, peripheral nervous system, liver and bone marrow. This may result in pigmentation disorders, hyperkeratosis, perforation of the nasal septum, neuropathy, anaemia and liver impairment. This substance is carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

MAK: skin absorption (H); carcinogen category: 1; germ cell mutagen group: 3A

ENVIRONMENT

The substance is toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

The substance is combustible but no flash point is available in literature.
Depending on the degree of exposure, periodic medical examination is suggested.
Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 23/25-50/53; S: (1/2)-20/21-28-45-60-61

BARIUM	ICSC: 1052 (October 1999)

CAS #: 7440-39-3
UN #: 1400
EC Number: 231-149-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable. Many reactions may cause fire or explosion. Finely dispersed particles form explosive mixtures in air.	NO open flames, NO sparks and NO smoking. NO contact with water. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use special powder, dry sand. NO water.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT wash away into sewer. Sweep spilled substance into covered sealable containers. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Separated from halogenated solvents, strong oxidants and acids. Dry. Keep under inert gas, oil or oxygen-free liquid.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 4.3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

BARIUM **ICSC: 1052**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
YELLOWISH-TO-WHITE LUSTROUS SOLID IN VARIOUS FORMS.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
The substance , if in powder form, may ignite spontaneously on contact with air. The substance is a strong reducing agent. It reacts violently with oxidants and acids. Reacts violently with halogenated solvents. Reacts with water. This produces flammable/explosive gas (hydrogen - see ICSC 0001). This generates fire and explosion hazard.

Formula: Ba
Atomic mass: 137.3
Boiling point: 1640°C
Melting point: 725°C
Density: 3.6 g/cm³
Solubility in water: reaction

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract.

Inhalation risk

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.5 mg/m^3, as TWA; A4 (not classifiable as a human carcinogen).
MAK: (as Ba, inhalable fraction): 0.5 mg/m^3; peak limitation category: II(8); pregnancy risk group: D.
EU-OEL: (as Ba): 0.5 mg/m^3 as TWA

ENVIRONMENT

NOTES

Reacts violently with fire extinguishing agents such as water, bicarbonate, powder, foam, and carbon dioxide.
Rinse contaminated clothing with plenty of water because of fire hazard.

ADDITIONAL INFORMATION

EC Classification

BERYLLIUM **ICSC: 0226 (November 2016)**
Glucinium

CAS #: 7440-41-7
UN #: 1567
EC Number: 231-150-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use fine water spray, dry powder, dry sand. NO other agents.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Laboured breathing. Shortness of breath. Sore throat. Symptoms may be delayed. See Notes.	Use closed system.	Fresh air, rest. Half-upright position. Refer for medical attention.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Wear protective gloves when administering first aid.
Eyes		Wear face shield or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from strong acids, bases, chlorinated solvents and food and feedstuffs. Well closed. Store only in original container. Store in an area without drain or sewer access.

PACKAGING

Unbreakable packaging.
Put breakable packaging into closed unbreakable container.
Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Flammable solid
Fatal if inhaled
May cause allergy or asthma symptoms or breathing difficulties if inhaled
May cause an allergic skin reaction
May cause cancer
Causes damage to lungs if inhaled
Causes damage to the lungs through prolonged or repeated exposure
May cause long lasting harmful effects to aquatic life

Transportation
UN Classification
UN Hazard Class: 6.1; UN Subsidiary Risks: 4.1; UN Pack Group: II

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

BERYLLIUM **ICSC: 0226**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
GREY SOLID IN VARIOUS FORMS.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
Reacts with strong acids and strong bases. This produces flammable/explosive gas (hydrogen - see ICSC 0001). Mixtures with some chlorinated solvents, such as carbon tetrachloride and trichloroethylene are shock-sensitive. On combustion, forms toxic fumes including beryllium oxide (see ICSC 1325).

Formula: Be
Atomic mass: 9.0
Boiling point: >2400°C
Melting point: 1287°C
Density: 1.9 g/cm³
Solubility in water: insoluble

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body in hazardous amounts by inhalation of its aerosol and by ingestion.

Effects of short-term exposure
The substance is irritating to the respiratory tract. Inhalation of dust or fume may cause chemical pneumonitis. The effects may be delayed. Medical observation is indicated. Exposure could cause death.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
Sensitization to the substance, through repeated or prolonged inhalation or skin contact, may result in serious granulomatous lung disease (chronic beryllium disease). This substance is carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: (inhalable fraction): 0.00005 mg/m^3, as TWA; A1 (confirmed human carcinogen); (skin); (SEN).
MAK: sensitization of respiratory tract and skin (SAH); carcinogen category: 1.
EU-OEL: (inhalable fraction): 0.0002 mg/m^3 as TWA; (skin and respiratory sensitizer); (see Notes)

ENVIRONMENT

The substance may cause long-term effects in the aquatic environment.

NOTES

The substance is combustible but no flash point is available in literature.
The symptoms of acute pneumonitis following a massive short-term exposure do not become manifest until 3 days.
Depending on the degree of exposure, periodic medical examination is suggested.
Do NOT take working clothes home.
Isolate contaminated clothing by sealing in a bag or other container.
An EU-OEL of 0.0006 mg/m^3 is allowed until 11 July 2026.

ADDITIONAL INFORMATION

EC Classification
Symbol: T+; R: 49-25-26-36/37/38-43-48/23; S: 53-45; Note: E

CADMIUM	ICSC: 0020 (April 2005)

CAS #: 7440-43-9
UN #: 2570
EC Number: 231-152-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	May ignite spontaneously on contact with air. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air.	NO open flames, NO sparks and NO smoking. NO contact with heat or acids. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use dry sand. Use special powder. NO other agents.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Diarrhoea. Headache. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rest. Refer for medical attention .

SPILLAGE DISPOSAL

Evacuate danger area! Personal protection: chemical protection suit including self-contained breathing apparatus. Remove all ignition sources. Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Dry. Keep under inert gas. Separated from ignition sources, oxidants, acids and food and feedstuffs.

PACKAGING

Airtight.
Unbreakable packaging.
Put breakable packaging into closed unbreakable container.
Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

CADMIUM **ICSC: 0020**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
SOFT BLUE-WHITE METAL LUMPS OR GREY POWDER. MALLEABLE. TURNS BRITTLE ON EXPOSURE TO 80°C. TARNISHES ON EXPOSURE TO MOIST AIR.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
Reacts with acids. This produces flammable/explosive gas (hydrogen - see ICSC 0001). The dust reacts with oxidants, hydrogen azide, zinc, selenium and tellurium. This generates fire and explosion hazard.

Formula: Cd
Atomic mass: 112.4
Boiling point: 765°C
Melting point: 321°C
Density: 8.6 g/cm³
Solubility in water: none
Auto-ignition temperature: 250°C (cadmium metal dust)

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Effects of short-term exposure
The fume is irritating to the respiratory tract. Inhalation of fumes may cause lung oedema. See Notes. Inhalation of fumes may cause metal fume fever. The effects may be delayed. Medical observation is indicated.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

Effects of long-term or repeated exposure
Repeated or prolonged inhalation of dust particles may cause effects on the lungs. The substance may have effects on the kidneys. This may result in kidney impairment. This substance is carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.01 mg/m^3, as TWA; A2 (suspected human carcinogen); BEI issued.
MAK: (including its inorganic compounds, inhalable fraction): skin absorption (H); carcinogen category: 1; germ cell mutagen group: 3A.
EU-OEL: (inhalable fraction): 0.001 mg/m^3 as TWA; (see Notes)

ENVIRONMENT

NOTES

Reacts violently with fire extinguishing agents such as water, foam, carbon dioxide and halons.
Depending on the degree of exposure, periodic medical examination is suggested.
The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.
Do NOT take working clothes home.
UN numbers and packing group will vary according to the physical form of the substance.
An EU-OEL of 0.004 mg/m^3 is allowed until 11 July 2027.

ADDITIONAL INFORMATION

EC Classification
Symbol: T+, N; R: 45-26-48/23/25-62-63-68-50/53; S: 53-45-60-61; Note: E

CALCIUM POWDER (pyrophoric) **ICSC: 1192 (November 2019)**
Calcicat

CAS #: 7440-70-2
UN #: 1855
EC Number: 231-179-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Forms flammable gas on contact with water or damp air. May ignite spontaneously on contact with air. Risk of fire and explosion on contact with water or incompatible substances. See Chemical Dangers.	NO contact with air, water or incompatible substances. PREVENT DISPERSION OF DUST. Use non-sparking handtools.	NO water. Use special powder, dry sand. NO other agents. In case of fire: keep drums, etc., cool by spraying with water. NO direct contact with water.

PREVENT DISPERSION OF DUST! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Sore throat. Cough. Burning sensation. Shortness of breath.	Use local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention.
Skin	Redness. Pain. Serious skin burns.	Protective gloves. Protective clothing.	Rinse contaminated clothes (fire hazard) with plenty of water. Rinse skin with plenty of water or shower. Refer immediately for medical attention.
Eyes	Redness. Pain. Burns.	Wear safety goggles or face shield.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Burning sensation. Abdominal pain. Abdominal cramps. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Personal protection: complete protective clothing including self-contained breathing apparatus. Consult an expert! Remove all ignition sources. Cover the spilled material with dry sand or dry powder. Do NOT absorb in saw-dust or other combustible absorbents. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Dry. Well closed. Keep under inert gas. Separated from incompatible materials. See Chemical Dangers.

PACKAGING

Airtight.
Unbreakable packaging.
Put breakable packaging into closed unbreakable container.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Catches fire spontaneously if exposed to air
In contact with water releases flammable gases which may ignite spontaneously
Causes severe skin burns and eye damage

Transportation
UN Classification
UN Hazard Class: 4.2; UN Pack Group: I

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

CALCIUM POWDER (pyrophoric) **ICSC: 1192**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
SILVERY-WHITE-TO-GREY POWDER.

Physical dangers
Ignites in air when finely divided.

Chemical dangers
The substance is a strong reducing agent. Reacts with moisture, water, alcohols, halogens and many other substances. This produces flammable/explosive gas (hydrogen - see ICSC 0001).

Formula: Ca
Atomic mass: 40.1
Boiling point: 1484°C
Melting point: 837-841°C
Density (at 20°C): 1,54 g/cm³
Solubility in water: reaction
Vapour pressure: negligible

EXPOSURE & HEALTH EFFECTS

Routes of exposure
Serious local effects by all routes of exposure.

Effects of short-term exposure
The substance is corrosive to the eyes, skin and respiratory tract.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis.

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

Environmental effects from the substance have not been investigated adequately.

NOTES

Reacts violently with fire extinguishing agents such as water, foam, halons and carbon dioxide.
Do NOT take working clothes home.
Health effects of exposure to the substance have not been investigated adequately.

ADDITIONAL INFORMATION

EC Classification
H261

CHROMIUM Chrome	**ICSC: 0029 (October 2004)**
CAS #: 7440-47-3 **EC Number: 231-157-5**	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible under specific conditions.	If powder: NO open flames Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	In case of fire in the surroundings, use appropriate extinguishing media.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Cough.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting.	**According to UN GHS Criteria**
STORAGE	**Transportation** **UN Classification**
PACKAGING	

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

CHROMIUM **ICSC: 0029**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
GREY POWDER.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
Chromium is a catalytic substance and may cause reaction in contact with many organic and inorganic substances, causing fire and explosion hazard.

Formula: Cr
Atomic mass: 52.0
Boiling point: 2642°C
Melting point: 1900°C
Density: 7.15 g/cm³
Solubility in water: none

EXPOSURE & HEALTH EFFECTS

Routes of exposure

Effects of short-term exposure
May cause mechanical irritation to the eyes and respiratory tract.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

TLV: (as Cr(0), inhalable fraction): 0.5 mg/m^3, as TWA

ENVIRONMENT

NOTES

The surface of the chromium particles is oxidized to chromium(III)oxide in air.
See ICSC 1531.

ADDITIONAL INFORMATION

EC Classification

COBALT	ICSC: 0782 (April 2004)
CAS #: 7440-48-4 **EC Number: 231-158-0**	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	May ignite spontaneously on contact with air. Finely dispersed particles form explosive mixtures in air. Risk of fire and explosion on contact with oxidizing agents or acetylene.	NO contact with oxidizing agents. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use special powder, dry sand. NO other agents.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Cough. Shortness of breath. Sore throat. Wheezing.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink.

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.	**According to UN GHS Criteria** **Transportation** **UN Classification**
STORAGE	
Separated from strong oxidants.	
PACKAGING	

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

COBALT **ICSC: 0782**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
SILVER-GREY POWDER.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
The substance , when finely divided, may ignite spontaneously on contact with air and acetylene. Reacts with strong oxidants. This generates fire and explosion hazard.

Formula: Co
Atomic mass: 58.9
Boiling point: 2870°C
Melting point: 1493°C
Density: 8.9 g/cm³
Solubility in water: none

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation.

Effects of short-term exposure
The fume is irritating to the respiratory tract.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
Repeated or prolonged contact may cause skin sensitization. Repeated or prolonged inhalation may cause asthma. Repeated or prolonged inhalation may cause effects on the lungs. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: (inhalable fraction): 0.02 mg/m^3, as TWA; (DSEN); (RSEN); A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.
MAK: (inhalable fraction): skin absorption (H); sensitization of respiratory tract and skin (SAH); carcinogen category: 2; germ cell mutagen group: 3A

ENVIRONMENT

The substance is toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish and molluscs.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
The symptoms of asthma often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.
Anyone who has shown symptoms of asthma due to this substance should avoid all further contact.
Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn; R: 42/43-53; S: (2)-22-24-37-61

COPPER	ICSC: 0240 (November 2016)
CAS #: 7440-50-8 **UN #: 3089** **EC Number: 231-159-6**	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Finely dispersed particles form explosive mixtures in air.	NO open flames.	Use special powder, dry sand. NO other agents. Water may be ineffective.

PREVENT DISPERSION OF DUST!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Cough. Headache. Shortness of breath. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

See Chemical Dangers.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Flammable solid
Harmful if swallowed
Very toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 4.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

COPPER **ICSC: 0240**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
SOLID IN VARIOUS FORMS. TURNS GREEN ON EXPOSURE TO MOIST AIR.

Physical dangers
No data.

Chemical dangers
Mixtures with acetylenic compounds, ethylene oxide and azides are shock-sensitive. Reacts with strong oxidants such as chlorates, bromates and iodates. This generates explosion hazard.

Formula: Cu
Atomic mass: 63.5
Boiling point: 2595°C
Melting point: 1083°C
Relative density (water = 1): 8.9
Solubility in water: none
Octanol/water partition coefficient as log Pow: -0.57 (calculated)

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure
Inhalation of fumes may cause metal fume fever. See Notes.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
Repeated or prolonged contact may cause skin sensitization. Ingestion may cause effects on the liver.

OCCUPATIONAL EXPOSURE LIMITS

TLV: (fume, as Cu): 0.2 mg/m^3, as TWA.
TLV: (dust and mists, as Cu): 1 mg/m^3, as TWA.
MAK: (respirable fraction): 0.01 mg/m^3; peak limitation category: II(2); pregnancy risk group: C

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur along the food chain.

NOTES

The symptoms of metal fume fever do not become manifest until a few hours have passed.
UN 3089 refers to METAL POWDERS, FLAMMABLE, (n.o.s.)

ADDITIONAL INFORMATION

EC Classification

1 Identification

Product identifier

Product name: Iron powder

Stock number: 00170
CAS Number:
7439-89-6
EC number:
231-096-4
Relevant identified uses of the substance or mixture and uses advised against.
Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet
Manufacturer/Supplier:
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com
Information Department: Health, Safety and Environmental Department
Emergency telephone number:
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)

GHS02 Flame

Flam. Sol. 1 H228 Flammable solid.

GHS07

Eye Irrit. 2A H319 Causes serious eye irritation.
STOT SE 3 H335 May cause respiratory irritation.
Hazards not otherwise classified No information known.

Label elements
GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
Hazard pictograms

GHS02 GHS07

Signal word Danger
Hazard statements
H228 Flammable solid.
H319 Causes serious eye irritation.
H335 May cause respiratory irritation.
Precautionary statements
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P261 Avoid breathing dust/fume/gas/mist/vapors/spray
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
WHMIS classification
B4 - Flammable solid
D2B - Toxic material causing other toxic effects

Classification system
HMIS ratings (scale 0-4)
(Hazardous Materials Identification System)

Health (acute effects) = 1
Flammability = 3
Physical Hazard = 1

Other hazards
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances
CAS# Description:
7439-89-6 Iron
Concentration: ≤100%
Identification number(s):
EC number: 231-096-4

(Contd. on page 2)

Product name: Iron powder

(Contd. of page 1)

4 First-aid measures

Description of first aid measures
After inhalation
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.
After skin contact
Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.
After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.
After swallowing Seek medical treatment.
Information for doctor
Most important symptoms and effects, both acute and delayed Causes serious eye irritation.
Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media
Suitable extinguishing agents Special powder for metal fires. Do not use water.
For safety reasons unsuitable extinguishing agents Water
Special hazards arising from the substance or mixture
If this product is involved in a fire, the following can be released:
Iron oxides
Advice for firefighters
Protective equipment:
Wear self-contained respirator.
Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Keep away from ignition sources
Environmental precautions: Do not allow product to reach sewage system or any water course.
Methods and material for containment and cleaning up: Ensure adequate ventilation.
Prevention of secondary hazards: Keep away from ignition sources.
Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.
Protective Action Criteria for Chemicals
PAC-1: 3.2 mg/m3
PAC-2: 35 mg/m3
PAC-3: 150 mg/m3

7 Handling and storage

Handling
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.
Information about protection against explosions and fires: Protect against electrostatic charges.

Conditions for safe storage, including any incompatibilities
Storage
Requirements to be met by storerooms and receptacles: Store in a cool location.
Information about storage in one common storage facility:
Do not store together with acids.
Store away from oxidizing agents.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters

Components with limit values that require monitoring at the workplace:	
7439-89-6 Iron (100.0%)	
EV (Canada)	Long-term value: 1* 5** mg/m³ as iron;*salts, water-soluble;**welding fume
TLV (Canada)	Long-term value: 5 mg/m³

Additional information: No data

Exposure controls
Personal protective equipment
General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Avoid contact with the eyes.
Avoid contact with the eyes and skin.
Maintain an ergonomically appropriate working environment.
Breathing equipment: Use suitable respirator when high concentrations are present.
Recommended filter device for short term use:
Use a respirator with type N95 (USA) or PE (EN 143) cartridges as a backup to engineering controls. Risk assessment should be performed to determine if air-purifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards.

(Contd. on page 3)

Product name: Iron powder

(Contd. of page 2)

Protection of hands:
Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.
Material of gloves Nitrile rubber, NBR
Penetration time of glove material (in minutes) 480

Glove thickness: 0.11 mm
Eye protection: Safety glasses with side shields / NIOSH (US) or EN 166(EU)
Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties
General Information
Appearance:

Form:	Powder
Odor:	Not determined
Odor threshold:	Not determined.
pH-value:	Not applicable.
Change in condition	
Melting point/Melting range:	1538 °C (2800 °F)
Boiling point/Boiling range:	2740 °C (4964 °F)
Sublimation temperature / start:	Not determined
Flammability (solid, gaseous)	Highly flammable.
Ignition temperature:	Not determined
Decomposition temperature:	Not determined
Auto igniting:	Not determined.
Danger of explosion:	Not determined.
Explosion limits:	
Lower:	Not determined
Upper:	Not determined
Vapor pressure:	Not applicable.
Density at 20 °C (68 °F):	7.87 g/cm³ (65.675 lbs/gal)
Bulk density at 20 °C (68 °F):	2900 kg/m³
Relative density	Not determined.
Vapor density	Not applicable.
Evaporation rate	Not applicable.
Solubility in / Miscibility with	
Water:	Not determined
Partition coefficient (n-octanol/water):	Not determined.
Viscosity:	
dynamic:	Not applicable.
kinematic:	Not applicable.
Other information	No further relevant information available.

10 Stability and reactivity

Reactivity No information known.
Chemical stability Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions Reacts with strong oxidizing agents
Conditions to avoid No further relevant information available.
Incompatible materials:
Acids
Oxidizing agents
Hazardous decomposition products: Iron oxides

11 Toxicological information

Information on toxicological effects
Acute toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance.

LD/LC50 values that are relevant for classification:

Oral	LD50	30000 mg/kg (rat)

Skin irritation or corrosion: May cause irritation
Eye irritation or corrosion: May cause irritation
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: No effects known.
Carcinogenicity:
The Registry of Toxic Effects of Chemical Substances (RTECS) contains tumorigenic and/or carcinogenic and/or neoplastic data for this substance.
No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.

Reproductive toxicity: No effects known.

Specific target organ system toxicity - repeated exposure: No effects known.

Specific target organ system toxicity - single exposure: May cause respiratory irritation.

Aspiration hazard: No effects known.
Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Additional ecological information:
General notes: Avoid transfer into the environment.

(Contd. on page 4)

Product name: Iron powder

(Contd. of page 3)

Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

UN-Number **DOT, IMDG, IATA**	UN3089
UN proper shipping name **DOT** **ADR** **IMDG, IATA**	Metal powders, flammable, n.o.s. (Iron) 3089 Metal powders, flammable, n.o.s. METAL POWDER, FLAMMABLE, N.O.S. (Iron)
Transport hazard class(es)	
DOT	
	
Class **Label**	4.1 Flammable solids, self-reactive substances and solid desensitised explosives 4.1
ADR	
	
Class **Label**	4.1 (F3) Flammable solids, self-reactive substances and solid desensitised explosives 4.1
IMDG, IATA	
	
Class **Label**	4.1 Flammable solids, self-reactive substances and solid desensitised explosives 4.1
Packing group **DOT, ADR, IMDG, IATA**	II
Environmental hazards:	Not applicable.
Special precautions for user **EMS Number:** **Segregation groups** **Stowage Category** **Handling Code** **Segregation Code**	Warning: Flammable solids, self-reactive substances and solid desensitised explosives F-G,S-G Heavy metals and their salts (including their organometallic compounds), powdered metals B H1 Keep as dry as reasonably practicable SG17 Stow "separated from" class 5.1 SG25 Stow "separated from" goods of classes 2.1 and 3. SG26 In addition: from goods of classes 2.1 and 3 when stowed on deck of a containership a minimum distance of two container spaces athwartship shall be maintained, when stowed on ro-ro ships a distance of 6 m athwartship shall be maintained.
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.
Transport/Additional information:	
DOT **Quantity limitations** **Marine Pollutant (DOT):**	On passenger aircraft/rail: 15 kg On cargo aircraft only: 50 kg No
IMDG **Limited quantities (LQ)** **Excepted quantities (EQ)**	1 kg Code: E2 Maximum net quantity per inner packaging: 30 g Maximum net quantity per outer packaging: 500 g
UN "Model Regulation":	UN 3089 METAL POWDERS, FLAMMABLE, N.O.S., 4.1, II

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture
GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
Hazard pictograms

GHS02 GHS07

Signal word Danger
Hazard statements
H228 Flammable solid.
H319 Causes serious eye irritation.

(Contd. on page 5)

(Contd. of page 4)

H335 May cause respiratory irritation.
Precautionary statements
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P261 Avoid breathing dust/fume/gas/mist/vapors/spray
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Domestic Substances List (DSL).
SARA Section 313 (specific toxic chemical listings) Substance is not listed.
California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use: For use only by technically qualified individuals.
Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.
The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.
Substance is not listed.
Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.
Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department
Date of preparation/Revision: Print date, revision date and version number are in the header of each page.
Abbreviations and acronyms:
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bioaccumulative and Toxic
SVHC: Substances of Very High Concern
vPvB: very Persistent and very Bioaccumulative
ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)
Flam. Sol. 1: Flammable solids – Category 1
Eye Irrit. 2A: Serious eye damage/eye irritation – Category 2A
STOT SE 3: Specific target organ toxicity (single exposure) – Category 3

LEAD **ICSC: 0052 (November 2019)**
Plumbum

CAS #: 7439-92-1
UN #: 3077 (n.o.s.)
EC Number: 231-100-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.	Closed system, ventilation, explosion-proof electrical equipment and lighting.	In case of fire in the surroundings, use appropriate extinguishing media.

PREVENT DISPERSION OF DUST! STRICT HYGIENE!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Metallic taste. Abdominal pain. Headache. Confusion. Drowsiness. Unconsciousness. Convulsions.	Use local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention. See Notes.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Store only in original container. Separated from food and feedstuffs and incompatible materials. See Chemical Dangers. Store in an area without drain or sewer access.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Suspected of causing cancer
May damage fertility or the unborn child
May cause harm to breast-fed children
Causes damage to organs
Causes damage to organs through prolonged or repeated exposure
Toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 9; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

LEAD **ICSC: 0052**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
BLUE SILVERY-WHITE-TO-GREY POWDER.

Physical dangers

Chemical dangers
Upon heating, toxic fumes are formed. Reacts with strong oxidants and strong acids. This generates toxic, fire and explosion hazard.

Formula: Pb
Atomic mass: [207.2]
Boiling point: 1740°C
Melting point: 327.5°C
Density: 11.34 g/cm³
Solubility in water, g/l: (practically insoluble)

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure
Inhalation of high concentrations may cause effects on multiple organs. See Acute Hazards/Symptoms.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
The substance may have effects on the blood, bone marrow, nervous system and kidneys. This may result in anaemia, encephalopathy (for example, convulsions), peripheral nerve disease, abdominal cramps, kidney impairment, cardiovascular disorders and hearing loss. See Notes. This substance is possibly carcinogenic to humans. Causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.05 mg/m^3, as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued.
MAK: carcinogen category: 2; germ cell mutagen group: 3A.
EU-OEL: (binding): 0.15 mg/m^3 as TWA

ENVIRONMENT

The substance is toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES

Specific treatment may be necessary in case of poisoning with this substance.
Depending on the degree of exposure, periodic medical examination is suggested.
Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification

MAGNESIUM POWDER (pyrophoric)	ICSC: 0289 (November 2019)

CAS #: 7439-95-4
UN #: 1418
EC Number: 231-104-6

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire. May ignite spontaneously on contact with air. Finely dispersed particles form explosive mixtures in air.	NO open flames, NO sparks and NO smoking. NO contact with moisture or any other substances. PREVENT DISPERSION OF DUST. Closed system, dust explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding).	Use dry sand, special powder. NO water. NO other agents. See Notes.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Shortness of breath.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation in the mouth.	Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL

Remove all ignition sources. Consult an expert! Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered dry containers. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT wash away into sewer.

STORAGE

Fireproof. Dry. Well closed. Separated from other incompatible materials.

PACKAGING

Airtight.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER
In contact with water releases flammable gases
Catches fire spontaneously if exposed to air

Transportation
UN Classification
UN Hazard Class: 4.3; UN Subsidiary Risks: 4.2; UN Pack Group: I, II, III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

MAGNESIUM POWDER (pyrophoric) **ICSC: 0289**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
GREY POWDER.

Physical dangers
Ignites in air when finely divided. Dust explosion possible if in powder or granular form, mixed with air. If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc.

Chemical dangers
The substance may ignite spontaneously on contact with air and moisture. This produces irritating or toxic fumes. Reacts with oxidants and many other substances. Reacts with moisture and acids. This produces flammable/explosive gas (hydrogen - see ICSC 0001). This generates fire and explosion hazard.

Formula: Mg
Atomic mass: 24.3
Boiling point: 1100°C
Melting point: 649°C
Density: 1.7 g/cm³
Solubility in water: reaction
Auto-ignition temperature: 473 °C
Explosive limits, vol% in air: see Notes

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of dust.

Effects of short-term exposure
The substance is irritating to the eyes and respiratory tract.

Inhalation risk
A nuisance-causing concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
Lungs may be affected by repeated or prolongated exposure to dust particles.

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

Environmental effects of the substance have been adequately investigated, but no significant effects have been found.

NOTES

Burns with an intense flame.
In order to prevent eye injury do not look directly at magnesium fires.
Explosive limits, vol% in air: (LEL) 0.03 kg/m³.
See ICSC 0701.
Reacts violently with fire extinguishing agents such as water, carbon dioxide, halons, powder and foam.

ADDITIONAL INFORMATION

EC Classification
H250; H260

MANGANESE	ICSC: 0174 (November 2003)
CAS #: 7439-96-5 **EC Number: 231-105-1**	

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Finely dispersed particles form explosive mixtures in air.	NO open flames. Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use dry sand, special powder.

PREVENT DISPERSION OF DUST! AVOID EXPOSURE OF (PREGNANT) WOMEN!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Cough.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves.	Rinse and then wash skin with water and soap.
Eyes		Wear safety goggles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Abdominal pain. Nausea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL	CLASSIFICATION & LABELLING
Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations.	**According to UN GHS Criteria** **Transportation** **UN Classification**
STORAGE	
Separated from acids. Dry.	
PACKAGING	

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

MANGANESE **ICSC: 0174**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
GREY-WHITE POWDER.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
Reacts slowly with water. Reacts more rapidly with steam and acids. This produces flammable/explosive gas (hydrogen - see ICSC 0001). This generates fire and explosion hazard.

Formula: Mn
Atomic mass: 54.9
Boiling point: 1962°C
Melting point: 1244°C
Density: 7.47 g/cm³
Solubility in water: none

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Effects of short-term exposure
The aerosol is irritating to the respiratory tract.

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

Effects of long-term or repeated exposure
The substance may have effects on the lungs and central nervous system. This may result in increased susceptibility to bronchitis, pneumonitis and neurologic and neuropsychiatric disorders (manganism). Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: (respirable fraction): 0.02 mg/m^3, as TWA.
TLV: (inhalable fraction): 0.1 mg/m^3, as TWA.
TLV: A4 (not classifiable as a human carcinogen).
EU-OEL: (inhalable fraction): 0.2 mg/m^3 as TWA.
EU-OEL: (respirable fraction): 0.05 mg/m^3 as TWA.
MAK: (inhalable fraction): 0.2 mg/m^3; (respirable fraction): 0.02 mg/m^3; peak limitation category: II(8); pregnancy risk group: C

ENVIRONMENT

This substance may be hazardous to the environment. Special attention should be given to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
The recommendations on this Card also apply to ferro manganese.

ADDITIONAL INFORMATION

EC Classification

MERCURY **ICSC: 0056 (November 2019)**

Quicksilver
Liquid silver

CAS #: 7439-97-6
UN #: 2809
EC Number: 231-106-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Shortness of breath. Fever. Vomiting. Diarrhoea. Abdominal pain. Headache. Weakness.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer immediately for medical attention.
Skin	MAY BE ABSORBED! Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. See Notes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes		Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Refer for medical attention .

SPILLAGE DISPOSAL

Evacuate danger area! Consult an expert! Personal protection: chemical protection suit and filter respirator for mercury adapted to the airborne concentration of the substance. Ventilation. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable non-metallic containers as far as possible. Then store and dispose of according to local regulations.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs. Well closed. Store in an area without drain or sewer access.

PACKAGING

Special material.
Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

May be corrosive to metals
Fatal if inhaled
May damage fertility or the unborn child
Causes damage to central nervous system and kidneys
Causes damage to the central nervous system and the kidneys through prolonged or repeated exposure
Very toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 8; UN Subsidiary Risks: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

MERCURY **ICSC: 0056**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
ODOURLESS HEAVY MOBILE SILVERY LIQUID METAL.

Physical dangers

Chemical dangers
Upon heating, toxic fumes are formed. Reacts violently with ammonia, halogens, acetylene and amines. This generates fire and explosion hazard. Attacks aluminium and many other metals. This produces amalgams.

Formula: Hg
Atomic mass: 200.6
Boiling point: 357°C
Melting point: -39°C
Density: 13.5 g/cm³
Solubility in water: none
Vapour pressure, Pa at 20°C: 0.26
Relative vapour density (air = 1): 6.93
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.009

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour and through the skin also as a vapour.

Effects of short-term exposure
The substance is irritating to the skin. Inhalation of high concentrations of the vapour may cause pneumonitis. This may result in death. The substance may cause effects on the central nervous system and kidneys. This may result in tremors and tissue lesions. The effects may be delayed. Medical observation is indicated.

Inhalation risk
A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

Effects of long-term or repeated exposure
The substance may have effects on the central nervous system and kidneys. This may result in irritability, emotional instability, tremors, mental and memory disturbances and speech disorders. May cause inflammation and discoloration of gums. Cumulative effects are possible. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.025 mg/m^3, as TWA; (skin); A4 (not classifiable as a human carcinogen); BEI issued.
EU-OEL: 0,02 mg/m^3 as TWA.
MAK: (inhalable fraction): 0.02 mg/m^3; peak limitation category: II(8); skin absorption (H); sensitization of skin (SH); carcinogen category: 3; pregnancy risk group: D

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish and seafood.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
There is no odour warning even when toxic concentrations are present.
Do NOT take working clothes home.
Isolate contaminated clothing by sealing in a bag or other container.
Other UN number: 3506 Mercury contained in manufactured articles.

ADDITIONAL INFORMATION

EC Classification
H330; H372; H400; H410; H360D

NICKEL **ICSC: 0062 (April 2017)**

Metallic nickel

CAS #: 7440-02-0

EC Number: 231-111-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Flammable as dust. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air.	Closed system, dust explosion-proof electrical equipment and lighting. Prevent deposition of dust.	Use dry sand, dry powder. NO carbon dioxide. NO water.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Shortness of breath.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness.	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. See Notes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Store only in original packaging. Cool. Well closed. Separated from strong oxidants and acids. Store in an area without drain or sewer access.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

May cause an allergic skin reaction
May cause allergy or asthma symptoms or breathing difficulties if inhaled
Suspected of causing cancer if inhaled
Causes damage to the lungs through prolonged or repeated exposure if inhaled
Harmful to aquatic life with long lasting effects

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

NICKEL **ICSC: 0062**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
SILVERY METALLIC LUSTROUS SOLID IN VARIOUS FORMS.

Physical dangers
If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc. Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
Reacts violently with acids. This produces flammable hydrogen. This generates fire and explosion hazard. Reacts violently with strong oxidants. This generates fire and explosion hazard. This produces toxic fumes of nickel monoxide. See ICSC 0926. On combustion, forms toxic gases and vapours including nickel (II) oxide (see ICSC 0926) and nickel carbonyl (see ICSC 0064).

Formula: Ni
Atomic mass: 58.7
Boiling point: 2730°C
Melting point: 1455°C
Density: 8.9 g/cm³
Solubility in water, mg/l at 37°C: 1.1 (practically insoluble)

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of dust.

Effects of short-term exposure
May cause mechanical irritation. Inhalation of fume may cause pneumonitis.

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

Effects of long-term or repeated exposure
Repeated or prolonged contact may cause skin sensitization. Repeated or prolonged inhalation may cause asthma. The substance may have effects on the respiratory tract. This may result in chronic inflammation of the respiratory tract and fibrosis. This substance is possibly carcinogenic to humans if inhaled.

OCCUPATIONAL EXPOSURE LIMITS

TLV: (inhalable fraction): 1.5 mg/m^3, as TWA; A5 (not suspected as a human carcinogen); BEI issued.
MAK: (inhalable fraction): sensitization of respiratory tract and skin (SAH); carcinogen category: 1

ENVIRONMENT

The substance is harmful to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

At high temperatures, toxic fumes of nickel(II)oxide may be formed (see ICSC 0926).
Depending on the degree of exposure, periodic medical examination is suggested.
The symptoms of asthma often do not become manifest until a few hours have passed and they are aggravated by physical effort.
Anyone who has shown symptoms of sensitization due to this substance should avoid all further contact with nickel, nickel compounds and other metal compounds of e.g. copper, chromium and cobalt.
Isolate contaminated clothing by sealing in a bag or other container.
Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn; R: 40-43; S: (2)-22-36

POTASSIUM **ICSC: 0716 (April 2006)**
Kalium

CAS #: 7440-09-7
UN #: 2257
EC Number: 231-119-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Many reactions may cause fire or explosion. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with acids, halogens or water.	NO contact with water, acids or halogens. NO open flames, NO sparks and NO smoking.	Use special powder, dry sand. NO other agents. Combat fire from a sheltered position.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation.	Use closed system or ventilation.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	Pain. Blisters. Serious skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Severe deep burns. Loss of vision.	Wear face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Cover the spilled material with dry powder.

STORAGE

Fireproof. Keep under mineral oil. Dry. Well closed.

PACKAGING

Airtight.
Unbreakable packaging.
Put breakable packaging into closed unbreakable container.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER
In contact with water releases flammable gases which may ignite spontaneously
Causes severe skin burns and eye damage

Transportation
UN Classification
UN Hazard Class: 4.3; UN Pack Group: I

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

POTASSIUM **ICSC: 0716**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
WHITE-TO-GREY LUMPS.

Physical dangers

Chemical dangers
Reacts violently with water. This generates fire and explosion hazard. Decomposes rapidly under the influence of air and moisture. This produces flammable/explosive gas (hydrogen - see ICSC 0001).

Formula: K
Atomic mass: 39.1
Boiling point: 765.5°C
Melting point: 63.2°C
Density: 0.856 g/cm³
Solubility in water: reaction
Vapour pressure at 20°C: negligible

EXPOSURE & HEALTH EFFECTS

Routes of exposure
Serious by all routes of exposure.

Effects of short-term exposure
See ICSC 0357 (potassium hydroxide).

Inhalation risk

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

NOTES

Potassium is always kept under mineral oil.
Reacts violently with fire extinguishing agents such as water and carbon dioxide.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, C; R: 14/15-34; S: (1/2)-5-8-45

SELENIUM	ICSC: 0072 (November 2009)

CAS #: 7782-49-2
UN #: 3283 (n.o.s.)
EC Number: 231-957-4

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with oxidants.	NO open flames. NO contact with oxidizing agents.	Use foam, powder, carbon dioxide. NO water.

STRICT HYGIENE!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Sore throat. Cough. Nasal discharge. Loss of smell. Headache.	Use ventilation, local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety spectacles or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Garlic breath. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Separated from strong oxidants, strong acids and food and feedstuffs. Dry. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

Airtight.
Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

May cause respiratory irritation
May cause damage to the nervous system and gastrointestinal tract
May cause damage to nervous system and gastrointestinal tract through prolonged or repeated exposure
Very toxic to aquatic life

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

SELENIUM **ICSC: 0072**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
GREY SOLID IN VARIOUS FORMS.

Physical dangers
No data.

Chemical dangers
Upon heating, toxic fumes are formed. Reacts with oxidants and strong acids. Reacts , if in amorphous form, with water at 50°C. This produces flammable/explosive gas (hydrogen - see ICSC 0001) and selenious acids.

Formula: Se
Atomic mass: 79.0
Boiling point: 685°C
Melting point: 217°C
Relative density (water = 1): 4.8
Solubility in water: none
Vapour pressure, Pa at 20°C: 0.1

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure
The substance is irritating to the respiratory tract. The substance may cause effects on the gastrointestinal tract and nervous system.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly on spraying or when dispersed, especially if powdered.

Effects of long-term or repeated exposure
The substance may have effects on the respiratory tract, gastrointestinal tract and skin.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.2 mg/m^3, as TWA.
MAK: (inhalable fraction): 0.02 mg/m^3; peak limitation category: II(8); skin absorption (H); carcinogen category: 3; pregnancy risk group: C

ENVIRONMENT

The substance is very toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

NOTES

Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification
Symbol: T; R: 23/25-33-53; S: (1/2)-20/21-28-45-61

SILVER **ICSC: 0810 (November 2019)**

Argentium
C.I. 77820

CAS #: 7440-22-4
UN #: 3077 (n.o.s.)
EC Number: 231-131-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. See Notes.		In case of fire in the surroundings: all extinguishing agents allowed.

PREVENT DISPERSION OF DUST!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety spectacles or eye protection in combination with breathing protection if powder.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Give one or two glasses of water to drink.

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Collect the spilled substance into containers. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.

STORAGE

Separated from : see Chemical Dangers. Store only in original packaging. Store in an area without drain or sewer access.

PACKAGING

CLASSIFICATION & LABELLING

According to UN GHS Criteria

WARNING

Very toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 9; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

SILVER **ICSC: 0810**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
WHITE METAL.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
See Notes. Reacts with many other substances. This generates fire and explosion hazard. Consult your supplier.

Formula: Ag
Atomic mass: 107.9
Boiling point: 2212°C
Melting point: 962°C
Relative density (water = 1): 10.5
Solubility in water, g/100ml: <0.01 (practically insoluble)

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation and by ingestion.

Effects of short-term exposure
May cause mechanical irritation to the eyes and respiratory tract.

Inhalation risk
No indication can be given whether a harmful concentration in the air will be reached.

Effects of long-term or repeated exposure
The substance may cause a grey-blue discolouration of the eyes, nose, throat and skin (argyria/argyrosis).

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.1 mg/m^3, as TWA.
MAK: (inhalable fraction): 0.1 mg/m^3; peak limitation category: II(8); pregnancy risk group: D.
EU-OEL: 0.1 mg/m^3 as TWA

ENVIRONMENT

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment. It is strongly advised not to let the chemical enter into the environment.

NOTES

Finely divided silver can be combustible and reactive; in its bulk form silver is stable and non-combustible.
There are insufficient data to assess the hazards of this substance in its nanoform (< 100 nm). Therefore the utmost care must be taken when using the substance. Consult your supplier.

ADDITIONAL INFORMATION

EC Classification

SODIUM **ICSC: 0717 (April 2006)**
Natrium

CAS #: 7440-23-5
UN #: 1428
EC Number: 231-132-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Many reactions may cause fire or explosion. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with acids, halogens or water.	NO contact with water, acids or halogens. NO open flames, NO sparks and NO smoking.	Use special powder, dry sand. NO other agents. Combat fire from a sheltered position.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Burning sensation.	Use closed system or ventilation.	Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.
Skin	Pain. Blisters. Serious skin burns.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .
Eyes	Severe deep burns. Loss of vision.	Wear face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Burning sensation. Shock or collapse.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Cover the spilled material with dry powder.

STORAGE

Fireproof. Keep under mineral oil. Dry. Well closed.

PACKAGING

Airtight.
Unbreakable packaging.
Put breakable packaging into closed unbreakable container.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER
In contact with water releases flammable gases which may ignite spontaneously
Causes severe skin burns and eye damage

Transportation
UN Classification
UN Hazard Class: 4.3; UN Pack Group: I

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

SODIUM	ICSC: 0717

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
SILVERY SOLID IN VARIOUS FORMS.

Physical dangers

Chemical dangers
Reacts violently with water. This generates fire and explosion hazard. Decomposes rapidly under the influence of air and moisture. This produces flammable/explosive gas (hydrogen - see ICSC 0001).

Formula: Na
Atomic mass: 23.0
Boiling point: 880°C
Melting point: 97.4°C
Density: 0.97 g/cm³
Solubility in water: reaction
Vapour pressure at 20°C: negligible
Auto-ignition temperature: 120-125°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
Serious by all routes of exposure.

Effects of short-term exposure
See ICSC 0360 (sodium hydroxide).

Inhalation risk

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

ENVIRONMENT

NOTES

Sodium is always kept under mineral oil.
Reacts violently with fire extinguishing agents such as water and carbon dioxide.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, C; R: 14/15-34; S: (1/2)-5-8-43-45

THALLIUM **ICSC: 0077 (April 2013)**

Ramor
Thallium (metal)

CAS #: 7440-28-0
UN #: 1707
EC Number: 231-138-1

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. Finely dispersed particles form explosive mixtures in air.	PREVENT DISPERSION OF DUST.	In case of fire in the surroundings, use appropriate extinguishing media.

See Notes.

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	No acute symptoms expected.	Use ventilation.	
Skin		Protective gloves.	Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Abdominal pain. Nausea. Vomiting. Headache. Weakness. Muscle pain. Blurred vision. Restlessness. Convulsions. Increased heart rate. Symptoms may be delayed. See Notes.	Do not eat, drink, or smoke during work. Wash hands before eating.	Refer immediately for medical attention.

SPILLAGE DISPOSAL

Sweep spilled substance into sealable containers. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Separated from strong acids, fluorine, other halogens and food and feedstuffs. Store only in original container. Well closed.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Fatal if swallowed
May cause damage to gastrointestinal tract and the nervous system if swallowed

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

THALLIUM **ICSC: 0077**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
BLUISH-WHITE VERY SOFT METAL. TURNS GREY ON EXPOSURE TO AIR.

Physical dangers
Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers
The substance is a strong reducing agent. Reacts with strong acids. Reacts with fluorine and other halogens at room temperature.

Formula: Tl
Atomic mass: 204.4
Boiling point: 1457°C
Melting point: 304°C
Relative density (water = 1): 11.9
Solubility in water: none

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by ingestion.

Effects of short-term exposure
Ingestion could cause effects on the gastrointestinal tract and nervous system. Ingestion could cause hair loss. Ingestion of large amounts could cause death. The effects may be delayed. Medical observation is indicated. See Notes.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

TLV: (inhalable fraction): 0.02 mg/m^3, as TWA; (skin)

ENVIRONMENT

Environmental effects from the substance have not been investigated adequately.

NOTES

The symptoms of neurological disorders do not become manifest until after a few days.
Depending on the degree of exposure, periodic medical examination is suggested.
Thallium metal is usually kept under mineral oil or an argon atmosphere.
Thallium salts may have different toxicological properties.
See ICSCs 0336 and 1221.

ADDITIONAL INFORMATION

EC Classification
Symbol: T+; R: 26/28-33-53; S: (1/2)-13-28-45-61

1 Identification

Product identifier

Product name: Vanadium turnings

Stock number: 10420
CAS Number:
7440-62-2
EC number:
231-171-1
Relevant identified uses of the substance or mixture and uses advised against.
Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet
Manufacturer/Supplier:
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com
Information Department: Health, Safety and Environmental Department
Emergency telephone number:
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)
The substance is not classified as hazardous according to 29 CFR 1910 (OSHA GHS).
Hazards not otherwise classified No information known.

Label elements
GHS label elements Not applicable
Hazard pictograms Not applicable
Signal word Not applicable
Hazard statements Not applicable
WHMIS classification Not controlled
Classification system
HMIS ratings (scale 0-4)
(Hazardous Materials Identification System)

Health (acute effects) = 0
Flammability = 0
Physical Hazard = 0

Other hazards
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances
CAS# Description:
7440-62-2 Vanadium
Concentration: ≤100%
Identification number(s):
EC number: 231-171-1

4 First-aid measures

Description of first aid measures
General information No special measures required.
After inhalation Seek medical treatment in case of complaints.
After skin contact Generally the product does not irritate the skin.
After eye contact Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
After swallowing If symptoms persist consult doctor.
Information for doctor
Most important symptoms and effects, both acute and delayed No further relevant information available.
Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media
Suitable extinguishing agents Special powder for metal fires. Do not use water.
For safety reasons unsuitable extinguishing agents Water
Special hazards arising from the substance or mixture
If this product is involved in a fire, the following can be released:
Vanadium oxides
Advice for firefighters
Protective equipment: No special measures required.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures Not required.
Environmental precautions: Do not allow product to reach sewage system or any water course.
Methods and material for containment and cleaning up: Pick up mechanically.
Prevention of secondary hazards: No special measures required.
Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.

(Contd. on page 2)

Product name: Vanadium turnings

(Contd. of page 1)

See Section 13 for disposal information.
Protective Action Criteria for Chemicals
PAC-1: 3 mg/m3
PAC-2: 5.8 mg/m3
PAC-3: 35 mg/m3

7 Handling and storage

Handling
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Information about protection against explosions and fires: No special measures required.

Conditions for safe storage, including any incompatibilities
Storage
Requirements to be met by storerooms and receptacles: No special requirements.
Information about storage in one common storage facility:
Do not store together with acids.
Store away from oxidizing agents.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems: No further data; see section 7.

Control parameters
Components with limit values that require monitoring at the workplace:
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.
Additional information: No data

Exposure controls
Personal protective equipment
General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Maintain an ergonomically appropriate working environment.
Breathing equipment: Not required.
Recommended filter device for short term use:
Use a respirator with type N95 (USA) or PE (EN 143) cartridges as a backup to engineering controls. Risk assessment should be performed to determine if air-purifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards.
Protection of hands: Not required.
Material of gloves Nitrile rubber, NBR
Penetration time of glove material (in minutes) 480

Glove thickness: 0.11 mm
Eye protection: Safety glasses with side shields / NIOSH (US) or EN 166(EU)
Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties	
General Information	
Appearance:	
Form:	Solid in various forms
Odor:	Odorless
Odor threshold:	Not determined.
pH-value:	Not applicable.
Change in condition	
Melting point/Melting range:	1910 °C (3470 °F)
Boiling point/Boiling range:	3407 °C (6165 °F)
Sublimation temperature / start:	Not determined
Flammability (solid, gaseous)	Not determined.
Ignition temperature:	Not determined
Decomposition temperature:	Not determined
Auto igniting:	Not determined.
Danger of explosion:	Not determined.
Explosion limits:	
Lower:	Not determined
Upper:	Not determined
Vapor pressure:	Not applicable.
Density at 20 °C (68 °F):	6.11 g/cm³ (50.988 lbs/gal)
Bulk density at 20 °C (68 °F):	4000 kg/m³
Relative density	Not determined.
Vapor density	Not applicable.
Evaporation rate	Not applicable.
Solubility in / Miscibility with	
Water:	Insoluble
Partition coefficient (n-octanol/water):	Not determined.
Viscosity:	
dynamic:	Not applicable.
kinematic:	Not applicable.
Other information	No further relevant information available.

10 Stability and reactivity

Reactivity No information known.
Chemical stability Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions Reacts with strong oxidizing agents
Conditions to avoid No further relevant information available.

(Contd. on page 3)

Product name: Vanadium turnings

(Contd. of page 2)

Incompatible materials:
Acids
Oxidizing agents
Hazardous decomposition products: Vanadium oxides

11 Toxicological information

Information on toxicological effects
Acute toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance.
LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: May cause irritation
Eye irritation or corrosion: May cause irritation
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: No effects known.
Carcinogenicity:
The Registry of Toxic Effects of Chemical Substances (RTECS) contains tumorigenic and/or carcinogenic and/or neoplastic data for this substance.
No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.

Reproductive toxicity: No effects known.

Specific target organ system toxicity - repeated exposure: No effects known.

Specific target organ system toxicity - single exposure: No effects known.

Aspiration hazard: No effects known.
Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Additional ecological information:
General notes: Avoid transfer into the environment.
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

UN-Number **DOT, ADN, IMDG, IATA**	Not applicable
UN proper shipping name **DOT, ADR, ADN, IMDG, IATA**	Not applicable
Transport hazard class(es) **DOT, ADR, ADN, IMDG, IATA** **Class**	Not applicable
Packing group **DOT, ADR, IMDG, IATA**	Not applicable
Environmental hazards:	Not applicable.
Special precautions for user	Not applicable.
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.
Transport/Additional information: **DOT** **Marine Pollutant (DOT):**	No
UN "Model Regulation":	Not applicable

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture
GHS label elements Not applicable
Hazard pictograms Not applicable
Signal word Not applicable
Hazard statements Not applicable
National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Domestic Substances List (DSL).

SARA Section 313 (specific toxic chemical listings)

7440-62-2	Vanadium

California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use: For use only by technically qualified individuals.
Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.

(Contd. on page 4)

Product name: Vanadium turnings

(Contd. of page 3)

The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.
Substance is not listed.
Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.
Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department
Date of preparation/Revision: Print date, revision date and version number are in the header of each page.
Abbreviations and acronyms:
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bioaccumulative and Toxic
SVHC: Substances of Very High Concern
vPvB: very Persistent and very Bioaccumulative
ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)

ZINC POWDER (pyrophoric) **ICSC: 1205 (November 2019)**

Blue powder
Merrillite

CAS #: 7440-66-6
UN #: 1436 (zinc powder or dust)
EC Number: 231-175-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. May ignite spontaneously on contact with air. Many reactions may cause fire or explosion. Finely dispersed particles form explosive mixtures in air. Risk of fire and explosion on contact with water or incompatible substances. See Chemical Dangers.	NO open flames, NO sparks and NO smoking. NO contact with oxidizing agents, acids, bases, water or incompatible substances. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Prevent deposition of dust.	Use special powder, dry sand. NO water. NO foam, carbon dioxide. NO other agents. In case of fire: keep drums, etc., cool by spraying with water. NO direct contact of the substance with water.

PREVENT DISPERSION OF DUST!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Metallic taste. Sore throat. Cough. Weakness. Fever. See Effects of short-term exposure.	Use local exhaust.	Fresh air, rest. Seek medical attention if you feel unwell. See Notes.
Skin	No acute symptoms expected.	Protective gloves.	First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again.
Eyes	Redness.	Wear safety spectacles.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Refer for medical attention .

SPILLAGE DISPOSAL

Remove all ignition sources. Consult an expert! Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Sweep spilled substance into covered dry containers. Then store and dispose of according to local regulations.

STORAGE

Fireproof. Well closed. Separated from incompatible materials and : see Chemical Dangers. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

Airtight.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Catches fire spontaneously if exposed to air
In contact with water releases flammable gases which may ignite spontaneously
Very toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 4.3; UN Subsidiary Risks: 4.2

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

ZINC POWDER (pyrophoric) **ICSC: 1205**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
GREY-TO-BLUE POWDER.

Physical dangers
Ignites in air when finely divided. If dry, it can be charged electrostatically by swirling, pneumatic transport, pouring, etc.

Chemical dangers
On combustion forms zinc oxide fumes. See Notes. The substance is a strong reducing agent. It reacts violently with oxidants, acids and bases. Reacts with water. This produces flammable/explosive gas (hydrogen - see ICSC 0001). Reacts violently with sulfur, halogenated hydrocarbons and many other substances. This generates fire and explosion hazard.

Formula: Zn
Atomic mass: 65.4
Boiling point: 907°C
Melting point: 419°C
Density: 7.1 g/cm³
Solubility in water: reaction
Auto-ignition temperature: 460°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation.

Effects of short-term exposure
May cause mechanical irritation to the eyes and respiratory tract. Inhalation of the respirable fraction may cause metal fume fever. This may result in influenza-like symptoms. The effects may be delayed up to 48 hours.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered or as fumes.

Effects of long-term or repeated exposure
Repeated or prolonged contact with skin may cause dermatitis. Repeated or prolonged inhalation may cause effects on the lungs. This may result in reduced lung function .

OCCUPATIONAL EXPOSURE LIMITS

MAK: (as Zn, respirable fraction): 0.1 mg/m^3; peak limitation category: I(4); (as Zn, inhalable fraction): 2 mg/m^3; peak limitation category: I(2); pregnancy risk group: C; (DFG 2019)

ENVIRONMENT

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

Zinc oxide fumes formed during combustion may cause metal fume fever (see ICSC 0208).
The symptoms of metal fume fever do not become manifest until hours.
Zinc may contain trace amounts of arsenic, when forming hydrogen, may also form toxic gas arsine (see ICSC0001 and ICSC0222).
Zinc powder stabilized: Combustible solid, UN number: 3077, Hazard class: 9, Packing group: III; GHS: Warning, H400, H410.

ADDITIONAL INFORMATION

EC Classification
H250; H260; H400 / H400; H410

1,4-DIOXANE **ICSC: 0041 (November 2008)**

1,4-Diethylene dioxide
Dioxane
para-Dioxane

CAS #: 123-91-1
UN #: 1165
EC Number: 204-661-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Highly flammable. Gives off irritating or toxic fumes (or gases) in a fire. Vapour/air mixtures are explosive. Risk of fire and explosion on contact with incompatible substances. See Chemical Dangers.	NO open flames, NO sparks and NO smoking. NO contact with strong oxidizing agents. NO contact with hot surfaces. Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	Use powder, alcohol-resistant foam, water spray, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

PREVENT GENERATION OF MISTS!			
	SYMPTOMS	**PREVENTION**	**FIRST AID**
Inhalation	Cough. Sore throat. Nausea. Dizziness. Headache. Drowsiness. Vomiting. Unconsciousness. Abdominal pain.	Use ventilation (not if powder), local exhaust or breathing protection.	Fresh air, rest. Refer immediately for medical attention.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness. Pain.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible).
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Seek medical attention if you feel unwell.

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Collect leaking liquid in sealable air tight containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT wash away into sewer.

STORAGE

Fireproof. Separated from strong oxidants, strong acids and incompatible materials. Cool. Dry. Well closed. Keep in the dark. Store only if stabilized. Store in an area without drain or sewer access.

PACKAGING

Airtight.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Highly flammable liquid and vapour
Causes eye irritation
May cause respiratory irritation
Suspected of causing cancer
May be harmful if swallowed and enters airways

Transportation
UN Classification
UN Hazard Class: 3; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

1,4-DIOXANE **ICSC: 0041**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS LIQUID WITH CHARACTERISTIC ODOUR.

Physical dangers
The vapour is heavier than air and may travel along the ground; distant ignition possible.

Chemical dangers
The substance can form explosive peroxides on exposure to air. Reacts with oxidants and strong acids. Reacts violently with some catalysts.

Formula: $C_4H_8O_2$
Molecular mass: 88.1
Boiling point: 101°C
Melting point: 12°C
Relative density (water = 1): 1.03
Solubility in water: miscible
Vapour pressure, kPa at 20°C: 3.9
Relative vapour density (air = 1): 3.0
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.08
Flash point: 12°C c.c.
Auto-ignition temperature: 180°C
Explosive limits, vol% in air: 2-22.0
Octanol/water partition coefficient as log Pow: -0.27
Viscosity: 1.17 mm²/s at 25°C

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its vapour and through the skin.

Effects of short-term exposure
The substance is irritating to the eyes and respiratory tract. If swallowed the substance may cause vomiting and could result in aspiration pneumonitis. Exposure at high levels could cause lowering of consciousness.

Inhalation risk
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C , on spraying or dispersing much faster.

Effects of long-term or repeated exposure
The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system, kidneys and liver. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 20 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: 37 mg/m^3, 10 ppm; peak limitation category: I(2); skin absorption (H); carcinogen category: 4; pregnancy risk group: C.
EU-OEL: 73 mg/m^3, 20 ppm as TWA

ENVIRONMENT

NOTES

Refer for medical attention if breathing difficulties and/or fever develop.
Check for peroxides prior to distillation; eliminate if found.

ADDITIONAL INFORMATION

EC Classification
Symbol: F, Xn; R: 11-19-36/37-40-66; S: (2)-9-16-36/37-46; Note: D

1H,1H,2H,2H-Perfluorooctanesulfonic acid

Safety Data Sheet 6164306

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 12/10/2015 Version: 1.0

SECTION 1: Identification

1.1. Identification

Product form	:	Substance
Substance name	:	1H,1H,2H,2H-Perfluorooctanesulfonic acid
CAS No	:	27619-97-2
Product code	:	6164-3-06
Formula	:	C8H5F13O3S
Synonyms	:	3,3,4,4,5,5,6,6,7,7,8,8,8-Tridecafluorooctanesulfonic acid
Other means of identification	:	MFCD00042455

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	:	Laboratory chemicals Manufacture of substances Scientific research and development

1.3. Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.
P.O. Box 309
Alachua, FL 32615 - United States of America
T (386) 462-0788 - F (386) 462-7097
info@synquestlabs.com - www.synquestlabs.com

1.4. Emergency telephone number

Emergency number	:	(844) 523-4086 (3E Company - Account 10069)

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Acute Tox. 4 (Oral)	H302 -	Harmful if swallowed
Skin Corr. 1B	H314 -	Causes severe skin burns and eye damage
Eye Dam. 1	H318 -	Causes serious eye damage
STOT SE 3	H335 -	May cause respiratory irritation

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :

GHS05 GHS07

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) :
H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H335 - May cause respiratory irritation

Precautionary statements (GHS-US) :
P260 - Do not breathe dust, mist, spray
P264 - Wash skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301+P312 - If swallowed: Call a POISON CENTER or doctor/ physician if you feel unwell
P301+P330+P331 - If swallowed: rinse mouth. Do NOT induce vomiting
P303+P361+P353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/ physician
P321 - Specific treatment (see supplemental first aid instructions on this label)
P330 - Rinse mouth

P363 - Wash contaminated clothing before reuse
P403+P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P501 - Dispose of contents/container to an approved waste disposal plant

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	Classification (GHS-US)
1H,1H,2H,2H-Perfluorooctanesulfonic acid (Main constituent)	(CAS No) 27619-97-2	<= 100	Acute Tox. 4 (Oral), H302 Skin Corr. 1B, H314 Eye Dam. 1, H318 STOT SE 3, H335

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Move the affected personnel away from the contaminated area.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Get immediate medical advice/attention.

First-aid measures after skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Get immediate medical advice/attention.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention.

First-aid measures after ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth out with water. Get immediate medical advice/attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11.

Symptoms/injuries after inhalation : Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Alcohol resistant foam. Carbon dioxide. Dry powder. Water spray. Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Thermal decomposition generates: Carbon oxides. Hydrogen fluoride. Sulfur oxides.

5.3. Advice for firefighters

Firefighting instructions : In case of fire: Evacuate area.

Protection during firefighting : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. For further information refer to section 8: "Exposure controls/personal protection".

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe dust.

6.1.1. For non-emergency personnel

Emergency procedures : Only qualified personnel equipped with suitable protective equipment may intervene.

6.1.2. For emergency responders

Protective equipment	:	Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment	:	Stop leak if safe to do so.
Methods for cleaning up	:	Sweep or shovel spills into appropriate container for disposal. Minimize generation of dust.
Other information	:	For disposal of solid materials or residues refer to section 13 : "Disposal considerations".

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Do not handle until all safety precautions have been read and understood. Ensure good ventilation of the work station. Do not breathe dust, mist, spray. Wear personal protective equipment. Avoid contact with skin and eyes.
Hygiene measures	:	Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures	:	Comply with applicable regulations.
Storage conditions	:	Keep container closed when not in use. Hygroscopic. Keep contents under inert gas.
Incompatible materials	:	Refer to Section 10 on Incompatible Materials.
Storage area	:	Store in dry, cool, well-ventilated area.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Exposure controls

Appropriate engineering controls	:	Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Hand protection	:	Protective gloves. 29 CFR 1910.138: Hand Protection.
Eye protection	:	Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.
Skin and body protection	:	Wear suitable protective clothing.
Respiratory protection	:	In case of inadequate ventilation wear respiratory protection. 29 CFR 1910.134: Respiratory Protection.
Other information	:	Safety shoes. 29 CFR 1910.136: Foot Protection.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Solid
Color	:	No data available
Odor	:	No data available
Odor threshold	:	No data available
pH	:	No data available
Melting point	:	> 300 °C
Freezing point	:	No data available
Boiling point	:	No data available
Flash point	:	No data available
Relative evaporation rate (butyl acetate=1)	:	No data available
Flammability (solid, gas)	:	No data available
Explosion limits	:	No data available
Explosive properties	:	No data available

Oxidizing properties	:	No data available
Vapor pressure	:	No data available
Relative density	:	No data available
Relative vapor density at 20 °C	:	No data available
Molecular mass	:	428.17 g/mol
Solubility	:	No data available
Log Pow	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

The product is stable at normal handling and storage conditions.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

Keep away from heat, sparks and flame.

10.5. Incompatible materials

Strong bases. Strong oxidizing agents.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	:	Oral: Harmful if swallowed.
Skin corrosion/irritation	:	Causes severe skin burns and eye damage.
Serious eye damage/irritation	:	Causes serious eye damage.
Respiratory or skin sensitization	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified
Specific target organ toxicity (single exposure)	:	May cause respiratory irritation.
Specific target organ toxicity (repeated exposure)	:	Not classified
Aspiration hazard	:	Not classified
Symptoms/injuries after inhalation	:	Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.

SECTION 12: Ecological information

12.1. Toxicity

No additional information available

12.2. Persistence and degradability

No additional information available

12.3. Bioaccumulative potential

No additional information available

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber.

Waste disposal recommendations : Dispose of contents/container in accordance with licensed collector's sorting instructions.

Additional information : Recycle the material as far as possible.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN3261 Corrosive solid, acidic, organic, n.o.s., 8, III

UN-No.(DOT) : UN3261

Proper Shipping Name (DOT) : Corrosive solid, acidic, organic, n.o.s.

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Hazard labels (DOT) : 8 - Corrosive

Packing group (DOT) : III - Minor Danger

DOT Packaging Non Bulk (49 CFR 173.xxx) : 213

DOT Packaging Bulk (49 CFR 173.xxx) : 240

DOT Symbols : G - Identifies PSN requiring a technical name

DOT Special Provisions (49 CFR 172.102) : IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2).
IP3 - Flexible IBCs must be sift-proof and water-resistant or must be fitted with a sift-proof and water-resistant liner.
T1 - 1.5 178.274(d)(2) Normal..... 178.275(d)(2)
TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.

DOT Packaging Exceptions (49 CFR 173.xxx) : 154

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 25 kg

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 100 kg

DOT Vessel Stowage Location : A - The material may be stowed ''on deck'' or ''under deck'' on a cargo vessel and on a passenger vessel.

Other information : No supplementary information available.

TDG

No additional information available

Transport by sea

UN-No. (IMDG)	:	3261
Proper Shipping Name (IMDG)	:	CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S.
Class (IMDG)	:	8 - Corrosive substances
Packing group (IMDG)	:	III - substances presenting low danger

Air transport

UN-No. (IATA)	:	3261
Proper Shipping Name (IATA)	:	Corrosive solid, acidic, organic, n.o.s.
Class (IATA)	:	8 - Corrosives
Packing group (IATA)	:	III - Minor Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

1H,1H,2H,2H-Perfluorooctanesulfonic acid (27619-97-2)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

CANADA

1H,1H,2H,2H-Perfluorooctanesulfonic acid (27619-97-2)
Listed on the Canadian NDSL (Non-Domestic Substances List)

EU-Regulations

No additional information available

National regulations

1H,1H,2H,2H-Perfluorooctanesulfonic acid (27619-97-2)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China) Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory Listed on the Japanese ISHL (Industrial Safety and Health Law) Listed on NZIoC (New Zealand Inventory of Chemicals)

15.3. US State regulations

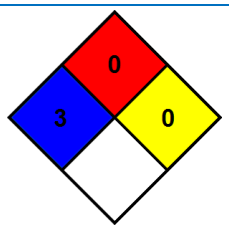
California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

SECTION 16: Other information

Full text of H-phrases:

Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Skin Corr. 1B	Skin corrosion/irritation Category 1B
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage
H335	May cause respiratory irritation

NFPA health hazard	:	3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.
NFPA fire hazard	:	0 - Materials that will not burn.
NFPA reactivity	:	0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health	:	3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given
Flammability	:	0 Minimal Hazard - Materials that will not burn
Physical	:	0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable or any damage resulting from handling or from contact with the above product.

1H,1H,2H,2H-Perfluorodecanesulfonic acid

Safety Data Sheet 61643X3

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 12/10/2015 Version: 1.0

SECTION 1: Identification

1.1. Identification

Product form	:	Substance
Substance name	:	1H,1H,2H,2H-Perfluorodecanesulfonic acid
CAS No	:	39108-34-4
Product code	:	6164-3-X3
Formula	:	C10H5F17O3S
Synonyms	:	3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-Heptadecafluorodecane-1-sulfonic acid
Other means of identification	:	MFCD14584757

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	:	Laboratory chemicals Manufacture of substances Scientific research and development

1.3. Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.
P.O. Box 309
Alachua, FL 32615 - United States of America
T (386) 462-0788 - F (386) 462-7097
info@synquestlabs.com - www.synquestlabs.com

1.4. Emergency telephone number

Emergency number	:	(844) 523-4086 (3E Company - Account 10069)

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Acute Tox. 4 (Oral)	H302 -	Harmful if swallowed
Skin Corr. 1B	H314 -	Causes severe skin burns and eye damage
Eye Dam. 1	H318 -	Causes serious eye damage
STOT SE 3	H335 -	May cause respiratory irritation

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :

GHS05 GHS07

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) :
H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H335 - May cause respiratory irritation

Precautionary statements (GHS-US) :
P260 - Do not breathe dust, mist, spray
P264 - Wash skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301+P312 - If swallowed: Call a POISON CENTER or doctor/ physician if you feel unwell
P301+P330+P331 - If swallowed: rinse mouth. Do NOT induce vomiting
P303+P361+P353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/ physician
P321 - Specific treatment (see supplemental first aid instructions on this label)
P330 - Rinse mouth

P363 - Wash contaminated clothing before reuse
P403+P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P501 - Dispose of contents/container to an approved waste disposal plant

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	Classification (GHS-US)
1H,1H,2H,2H-Perfluorodecanesulfonic acid (Main constituent)	(CAS No) 39108-34-4	<= 100	Acute Tox. 4 (Oral), H302 Skin Corr. 1B, H314 Eye Dam. 1, H318 STOT SE 3, H335

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Move the affected personnel away from the contaminated area.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Get immediate medical advice/attention.

First-aid measures after skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Get immediate medical advice/attention.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention.

First-aid measures after ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth out with water. Get immediate medical advice/attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11.

Symptoms/injuries after inhalation : Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Alcohol resistant foam. Carbon dioxide. Dry powder. Water spray. Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Thermal decomposition generates: Carbon oxides. Hydrogen fluoride. Sulfur oxides.

5.3. Advice for firefighters

Firefighting instructions : In case of fire: Evacuate area.

Protection during firefighting : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. For further information refer to section 8: "Exposure controls/personal protection".

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe dust.

6.1.1. For non-emergency personnel

Emergency procedures : Only qualified personnel equipped with suitable protective equipment may intervene.

6.1.2. For emergency responders

Protective equipment	:	Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment	:	Stop leak if safe to do so.
Methods for cleaning up	:	Sweep or shovel spills into appropriate container for disposal. Minimize generation of dust.
Other information	:	For disposal of solid materials or residues refer to section 13 : "Disposal considerations".

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Do not handle until all safety precautions have been read and understood. Ensure good ventilation of the work station. Do not breathe dust, mist, spray. Wear personal protective equipment. Avoid contact with skin and eyes.
Hygiene measures	:	Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures	:	Comply with applicable regulations.
Storage conditions	:	Keep container closed when not in use. Hygroscopic. Keep contents under inert gas.
Incompatible materials	:	Refer to Section 10 on Incompatible Materials.
Storage area	:	Store in dry, cool, well-ventilated area.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Exposure controls

Appropriate engineering controls	:	Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Hand protection	:	Protective gloves. 29 CFR 1910.138: Hand Protection.
Eye protection	:	Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.
Skin and body protection	:	Wear suitable protective clothing.
Respiratory protection	:	In case of inadequate ventilation wear respiratory protection. 29 CFR 1910.134: Respiratory Protection.
Other information	:	Safety shoes. 29 CFR 1910.136: Foot Protection.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Solid
Color	:	No data available
Odor	:	No data available
Odor threshold	:	No data available
pH	:	No data available
Melting point	:	No data available
Freezing point	:	No data available
Boiling point	:	No data available
Flash point	:	No data available
Relative evaporation rate (butyl acetate=1)	:	No data available
Flammability (solid, gas)	:	No data available
Explosion limits	:	No data available
Explosive properties	:	No data available

Oxidizing properties	:	No data available
Vapor pressure	:	No data available
Relative density	:	No data available
Relative vapor density at 20 °C	:	No data available
Molecular mass	:	528.18 g/mol
Solubility	:	No data available
Log Pow	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

The product is stable at normal handling and storage conditions.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

Keep away from heat, sparks and flame.

10.5. Incompatible materials

Strong bases. Strong oxidizing agents.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	:	Oral: Harmful if swallowed.
Skin corrosion/irritation	:	Causes severe skin burns and eye damage.
Serious eye damage/irritation	:	Causes serious eye damage.
Respiratory or skin sensitization	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified
Specific target organ toxicity (single exposure)	:	May cause respiratory irritation.
Specific target organ toxicity (repeated exposure)	:	Not classified
Aspiration hazard	:	Not classified
Symptoms/injuries after inhalation	:	Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.

SECTION 12: Ecological information

12.1. Toxicity

No additional information available

12.2. Persistence and degradability

No additional information available

12.3. Bioaccumulative potential

No additional information available

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber.

Waste disposal recommendations : Dispose of contents/container in accordance with licensed collector's sorting instructions.

Additional information : Recycle the material as far as possible.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN3261 Corrosive solid, acidic, organic, n.o.s., 8, III

UN-No.(DOT) : UN3261

Proper Shipping Name (DOT) : Corrosive solid, acidic, organic, n.o.s.

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Hazard labels (DOT) : 8 - Corrosive

Packing group (DOT) : III - Minor Danger

DOT Packaging Non Bulk (49 CFR 173.xxx) : 213

DOT Packaging Bulk (49 CFR 173.xxx) : 240

DOT Symbols : G - Identifies PSN requiring a technical name

DOT Special Provisions (49 CFR 172.102) : IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2).
IP3 - Flexible IBCs must be sift-proof and water-resistant or must be fitted with a sift-proof and water-resistant liner.
T1 - 1.5 178.274(d)(2) Normal..... 178.275(d)(2)
TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.

DOT Packaging Exceptions (49 CFR 173.xxx) : 154

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 25 kg

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 100 kg

DOT Vessel Stowage Location : A - The material may be stowed ''on deck'' or ''under deck'' on a cargo vessel and on a passenger vessel.

Other information : No supplementary information available.

TDG

No additional information available

Transport by sea

UN-No. (IMDG)	:	3261
Proper Shipping Name (IMDG)	:	CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S.
Class (IMDG)	:	8 - Corrosive substances
Packing group (IMDG)	:	III - substances presenting low danger

Air transport

UN-No. (IATA)	:	3261
Proper Shipping Name (IATA)	:	Corrosive solid, acidic, organic, n.o.s.
Class (IATA)	:	8 - Corrosives
Packing group (IATA)	:	III - Minor Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory except for:

1H,1H,2H,2H-Perfluorodecanesulfonic acid	CAS No 39108-34-4	100%

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

CANADA

No additional information available

EU-Regulations

No additional information available

National regulations

1H,1H,2H,2H-Perfluorodecanesulfonic acid (39108-34-4)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on the Japanese ISHL (Industrial Safety and Health Law)
Listed on NZIoC (New Zealand Inventory of Chemicals)

15.3. US State regulations

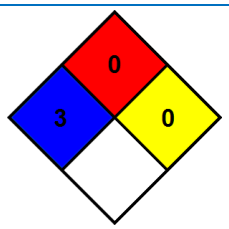
California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

SECTION 16: Other information

Full text of H-phrases:

Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Skin Corr. 1B	Skin corrosion/irritation Category 1B
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage
H335	May cause respiratory irritation

NFPA health hazard	:	3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.
NFPA fire hazard	:	0 - Materials that will not burn.
NFPA reactivity	:	0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health	:	3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given
Flammability	:	0 Minimal Hazard - Materials that will not burn
Physical	:	0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable or any damage resulting from handling or from contact with the above product.

Perfluorooctanesulfonamide

Safety Data Sheet 8169308

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 04/04/2016 Version: 1.0

SECTION 1: Identification

1.1. Identification

Product form	:	Substance
Substance name	:	Perfluorooctanesulfonamide
CAS No	:	754-91-6
Product code	:	8169-3-08
Formula	:	C8H2F17NO2S
Synonyms	:	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-Heptadecafluorooctane-1-sulfonamide
Other means of identification	:	MFCD03094345

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	:	Laboratory chemicals Manufacture of substances Scientific research and development

1.3. Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.
P.O. Box 309
Alachua, FL 32615 - United States of America
T (386) 462-0788 - F (386) 462-7097
info@synquestlabs.com - www.synquestlabs.com

1.4. Emergency telephone number

Emergency number	:	(844) 523-4086 (3E Company - Account 10069)

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Skin Irrit. 2 H315 - Causes skin irritation
Eye Irrit. 2A H319 - Causes serious eye irritation
STOT SE 3 H335 - May cause respiratory irritation

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :

GHS07

Signal word (GHS-US) : Warning

Hazard statements (GHS-US) :
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H335 - May cause respiratory irritation

Precautionary statements (GHS-US) :
P261 - Avoid breathing dust, mist, spray
P264 - Wash skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P302+P352 - If on skin: Wash with plenty of soap and water
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P312 - Call a POISON CENTER or doctor/physician if you feel unwell
P321 - Specific treatment (see supplemental first aid instructions on this label)
P332+P313 - If skin irritation occurs: Get medical advice/attention
P337+P313 - If eye irritation persists: Get medical advice/attention
P362+P364 - Take off contaminated clothing and wash it before reuse
P403+P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P501 - Dispose of contents/container to an approved waste disposal plant

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	Classification (GHS-US)
Perfluorooctanesulfonamide (Main constituent)	(CAS No) 754-91-6	<= 100	Skin Irrit. 2, H315 Eye Irrit. 2A, H319 STOT SE 3, H335

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Move the affected personnel away from the contaminated area.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Get medical advice/attention.

First-aid measures after skin contact : Wash with plenty of soap and water. Get medical advice/attention.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice/attention.

First-aid measures after ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth out with water. Get medical advice/attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Alcohol resistant foam. Carbon dioxide. Dry powder. Water spray. Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Thermal decomposition generates: Carbon oxides. Hydrogen fluoride. Nitrogen oxides. Sulfur oxides.

5.3. Advice for firefighters

Firefighting instructions : In case of fire: Evacuate area.

Protection during firefighting : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. For further information refer to section 8: "Exposure controls/personal protection".

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe dust.

6.1.1. For non-emergency personnel

Emergency procedures : Only qualified personnel equipped with suitable protective equipment may intervene.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment	:	Stop leak if safe to do so.
Methods for cleaning up	:	Sweep or shovel spills into appropriate container for disposal. Minimize generation of dust.
Other information	:	For disposal of solid materials or residues refer to section 13 : "Disposal considerations".

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Do not handle until all safety precautions have been read and understood. Ensure good ventilation of the work station. Do not breathe dust, mist, spray. Wear personal protective equipment. Avoid contact with skin and eyes.
Hygiene measures	:	Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures	:	Comply with applicable regulations.
Storage conditions	:	Keep container closed when not in use.
Incompatible materials	:	Refer to Section 10 on Incompatible Materials.
Storage area	:	Store in dry, cool, well-ventilated area.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Exposure controls

Appropriate engineering controls	:	Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Hand protection	:	Protective gloves. 29 CFR 1910.138: Hand Protection.
Eye protection	:	Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.
Skin and body protection	:	Wear suitable protective clothing.
Respiratory protection	:	In case of inadequate ventilation wear respiratory protection. 29 CFR 1910.134: Respiratory Protection.
Other information	:	Safety shoes. 29 CFR 1910.136: Foot Protection.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Solid
Color	:	No data available
Odor	:	No data available
Odor threshold	:	No data available
pH	:	No data available
Melting point	:	154.6 °C
Freezing point	:	No data available
Boiling point	:	No data available
Flash point	:	No data available
Relative evaporation rate (butyl acetate=1)	:	No data available
Flammability (solid, gas)	:	No data available
Explosion limits	:	No data available
Explosive properties	:	No data available
Oxidizing properties	:	No data available
Vapor pressure	:	No data available
Relative density	:	No data available
Relative vapor density at 20 °C	:	No data available
Molecular mass	:	499.15 g/mol

Solubility	:	No data available
Log Pow	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

The product is stable at normal handling and storage conditions.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

Keep away from heat, sparks and flame.

10.5. Incompatible materials

Strong oxidizing agents.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Perfluorooctanesulfonamide (754-91-6)	
LD50 oral rat	> 172 mg/kg

Skin corrosion/irritation	:	Causes skin irritation.
Serious eye damage/irritation	:	Causes serious eye irritation.
Respiratory or skin sensitization	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified
Specific target organ toxicity (single exposure)	:	May cause respiratory irritation.
Specific target organ toxicity (repeated exposure)	:	Not classified
Aspiration hazard	:	Not classified

SECTION 12: Ecological information

12.1. Toxicity

No additional information available

12.2. Persistence and degradability

No additional information available

12.3. Bioaccumulative potential

No additional information available

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber.

Waste disposal recommendations : Dispose of contents/container in accordance with licensed collector's sorting instructions.

Additional information : Recycle the material as far as possible.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Not regulated for transport

TDG

No additional information available

Transport by sea

No additional information available

Air transport

No additional information available

SECTION 15: Regulatory information

15.1. US Federal regulations

Perfluorooctanesulfonamide (754-91-6)	
EPA TSCA Regulatory Flag	S - S - indicates a substance that is identified in a proposed or final Significant New Uses Rule.

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory except for:

Perfluorooctanesulfonamide	CAS No 754-91-6	100%

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

CANADA

No additional information available

EU-Regulations

No additional information available

National regulations

Perfluorooctanesulfonamide (754-91-6)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China) Listed on the Japanese ISHL (Industrial Safety and Health Law) Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

SECTION 16: Other information

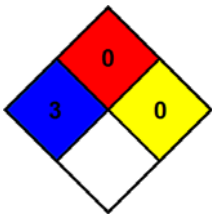
Full text of H-phrases:

Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H315	Causes skin irritation
H319	Causes serious eye irritation
H335	May cause respiratory irritation

NFPA health hazard : 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health : 2 Moderate Hazard - Temporary or minor injury may occur

Flammability : 0 Minimal Hazard - Materials that will not burn

Physical : 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable or any damage resulting from handling or from contact with the above product.

SAFETY DATA SHEET

N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

According to Regulation (EC) No 1907/2006, Annex II, as amended. Commission Regulation (EU) No 2015/830 of 28 May 2015.

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

Product number FE91897

CAS number 2991-50-6

EC number 221-061-1

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses Laboratory reagent. Manufacture of substances. Research and development.

1.3. Details of the supplier of the safety data sheet

Supplier

Carbosynth Ltd
8&9 Old Station Business Park
Compton
Berkshire
RG20 6NE
UK
+44 1635 578444
+44 1635 579444
info@carbosynth.com

1.4. Emergency telephone number

Emergency telephone +44 7887 998634

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification (EC 1272/2008)

Physical hazards Not Classified

Health hazards Skin Irrit. 2 - H315 Eye Irrit. 2 - H319 STOT SE 3 - H335

Environmental hazards Not Classified

2.2. Label elements

EC number 221-061-1

Hazard pictograms

Signal word Warning

N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

Hazard statements H315 Causes skin irritation.
H319 Causes serious eye irritation.
H335 May cause respiratory irritation.

Precautionary statements P264 Wash contaminated skin thoroughly after handling.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
P302+P352 IF ON SKIN: Wash with plenty of water.
P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

2.3. Other hazards

No data available.

SECTION 3: Composition/information on ingredients

3.1. Substances

Product name N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

CAS number 2991-50-6

EC number 221-061-1

Chemical formula $C_{12}H_8F_{17}NO_4S$

SECTION 4: First aid measures

4.1. Description of first aid measures

General information Get medical advice/attention if you feel unwell.

Inhalation Remove person to fresh air and keep comfortable for breathing. If breathing stops, provide artificial respiration. When breathing is difficult, properly trained personnel may assist affected person by administering oxygen. Get medical attention if symptoms are severe or persist.

Ingestion Do not induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth thoroughly with water. Give plenty of water to drink. Get medical attention if symptoms are severe or persist.

Skin contact Remove contaminated clothing. Rinse with water. Continue to rinse for at least 15 minutes. Wash contaminated clothing before reuse. Get medical attention if symptoms are severe or persist.

Eye contact Rinse immediately with plenty of water. Continue to rinse for at least 15 minutes. Get medical attention if symptoms are severe or persist.

4.2. Most important symptoms and effects, both acute and delayed

General information See Section 11 for additional information on health hazards.

4.3. Indication of any immediate medical attention and special treatment needed

Notes for the doctor Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media Extinguish with alcohol-resistant foam, carbon dioxide, dry powder or water fog. Use fire-extinguishing media suitable for the surrounding fire.

5.2. Special hazards arising from the substance or mixture

Specific hazards None known.

N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

Hazardous combustion products Thermal decomposition or combustion products may include the following substances: Harmful gases or vapours. Oxides of carbon. Oxides of nitrogen. Oxides of sulphur. Hydrogen fluoride (HF).

5.3. Advice for firefighters

Special protective equipment for firefighters Wear positive-pressure self-contained breathing apparatus (SCBA) and appropriate protective clothing. Firefighter's clothing conforming to European standard EN469 (including helmets, protective boots and gloves) will provide a basic level of protection for chemical incidents. Use protective equipment appropriate for surrounding materials.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions Wear protective clothing as described in Section 8 of this safety data sheet. No action shall be taken without appropriate training or involving any personal risk. Do not touch or walk into spilled material. Avoid inhalation of dust and vapours. Provide adequate ventilation. Keep unnecessary and unprotected personnel away from the spillage.

6.2. Environmental precautions

Environmental precautions Avoid discharge into drains or watercourses or onto the ground.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up Wear protective clothing as described in Section 8 of this safety data sheet. Collect powder using special dust vacuum cleaner with particle filter or carefully sweep into suitable waste disposal containers and seal securely. Clear up spills immediately and dispose of waste safely. Flush contaminated area with plenty of water. Wash thoroughly after dealing with a spillage. For waste disposal, see Section 13.

6.4. Reference to other sections

Reference to other sections For personal protection, see Section 8. See Section 11 for additional information on health hazards. See Section 12 for additional information on ecological hazards. For waste disposal, see Section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Usage precautions Wear protective clothing as described in Section 8 of this safety data sheet. Wash hands thoroughly after handling. Provide adequate ventilation. Avoid generation and spreading of dust. Avoid contact with skin and eyes. Avoid inhalation of dust and vapours.

7.2. Conditions for safe storage, including any incompatibilities

Storage precautions Keep container tightly closed. Store in a cool and well-ventilated place. Store contents under inert gas. Store at temperatures between -15°C and -25°C.

7.3. Specific end use(s)

Specific end use(s) The identified uses for this product are detailed in Section 1.2.

SECTION 8: Exposure controls/Personal protection

8.1. Control parameters

Occupational exposure limits

No exposure limits known for ingredient(s).

8.2. Exposure controls

Appropriate engineering controls Provide adequate ventilation. Observe any occupational exposure limits for the product or ingredients.

N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

Eye/face protection	Unless the assessment indicates a higher degree of protection is required, the following protection should be worn: Tight-fitting safety glasses. Personal protective equipment for eye and face protection should comply with European Standard EN166.
Hand protection	Wear protective gloves. To protect hands from chemicals, gloves should comply with European Standard EN374.
Other skin and body protection	Wear appropriate clothing to prevent repeated or prolonged skin contact.
Respiratory protection	Respiratory protection complying with an approved standard should be worn if a risk assessment indicates inhalation of contaminants is possible. Ensure all respiratory protective equipment is suitable for its intended use and is 'CE'-marked. Particulate filters should comply with European Standard EN143. Full face mask respirators with replaceable filter cartridges should comply with European Standard EN136. Half mask and quarter mask respirators with replaceable filter cartridges should comply with European Standard EN140.
Environmental exposure controls	Keep container tightly sealed when not in use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	Solid.
Colour	White. to Off-white.
Odour	No data available.
Odour threshold	No data available.
pH	No data available.
Melting point	>69°C
Initial boiling point and range	No data available.
Flash point	No data available.
Evaporation rate	No data available.
Flammability (solid, gas)	No data available.
Upper/lower flammability or explosive limits	No data available.
Vapour pressure	No data available.
Vapour density	No data available.
Relative density	No data available.
Solubility(ies)	Almost insoluble in the following materials: DMSO Methanol.
Partition coefficient	No data available.
Auto-ignition temperature	No data available.
Decomposition Temperature	No data available.
Viscosity	No data available.
Explosive properties	No data available.
Oxidising properties	No data available.

N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

9.2. Other information

Molecular weight 585.24

SECTION 10: Stability and reactivity

10.1. Reactivity

Reactivity No data available.

10.2. Chemical stability

Stability Stable under the prescribed storage conditions.

10.3. Possibility of hazardous reactions

Possibility of hazardous reactions No data available.

10.4. Conditions to avoid

Conditions to avoid No data available.

10.5. Incompatible materials

Materials to avoid Strong oxidising agents.

10.6. Hazardous decomposition products

Hazardous decomposition products Oxides of carbon. Oxides of nitrogen. Oxides of sulphur. Hydrogen fluoride (HF).

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity - oral

Notes (oral LD_{50}) Based on available data the classification criteria are not met.

Acute toxicity - dermal

Notes (dermal LD_{50}) Based on available data the classification criteria are not met.

Acute toxicity - inhalation

Notes (inhalation LC_{50}) Based on available data the classification criteria are not met.

Skin corrosion/irritation

Animal data Irritating.

Serious eye damage/irritation

Serious eye damage/irritation Causes serious eye irritation.

Respiratory sensitisation

Respiratory sensitisation Based on available data the classification criteria are not met.

Skin sensitisation

Skin sensitisation Based on available data the classification criteria are not met.

Germ cell mutagenicity

Genotoxicity - in vitro Based on available data the classification criteria are not met.

Carcinogenicity

Carcinogenicity Based on available data the classification criteria are not met.

IARC carcinogenicity None of the ingredients are listed or exempt.

Reproductive toxicity

N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

Reproductive toxicity - fertility	Based on available data the classification criteria are not met.
Reproductive toxicity - development	Based on available data the classification criteria are not met.

Specific target organ toxicity - single exposure

STOT - single exposure	STOT SE 3 - H335 May cause respiratory irritation.
Target organs	Respiratory system, lungs

Specific target organ toxicity - repeated exposure

STOT - repeated exposure	Not classified as a specific target organ toxicant after repeated exposure.

Aspiration hazard

Aspiration hazard	Not relevant. Solid.

General information	Dust may irritate the eyes and the respiratory system. The severity of the symptoms described will vary dependent on the concentration and the length of exposure.
Inhalation	A single exposure may cause the following adverse effects: Irritation of nose, throat and airway. Difficulty in breathing. Coughing.
Ingestion	May cause irritation.
Skin contact	Redness. Irritating to skin.
Eye contact	Irritating to eyes.
Route of exposure	Ingestion Inhalation Skin and/or eye contact
Target organs	Respiratory system, lungs

N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

SECTION 12: Ecological information

Ecotoxicity Not regarded as dangerous for the environment. However, large or frequent spills may have hazardous effects on the environment.

12.1. Toxicity

Toxicity Based on available data the classification criteria are not met.

12.2. Persistence and degradability

Persistence and degradability The degradability of the product is not known.

12.3. Bioaccumulative potential

Bioaccumulative potential No data available on bioaccumulation.

Partition coefficient No data available.

12.4. Mobility in soil

Mobility No data available.

12.5. Results of PBT and vPvB assessment

Results of PBT and vPvB assessment No data available.

12.6. Other adverse effects

Other adverse effects None known.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

General information Dispose of waste to licensed waste disposal site in accordance with the requirements of the local Waste Disposal Authority. This material and its container must be disposed of in a safe way. When handling waste, the safety precautions applying to handling of the product should be considered.

SECTION 14: Transport information

General The product is not covered by international regulations on the transport of dangerous goods (IMDG, IATA, ADR/RID).

14.1. UN number

Not applicable.

14.2. UN proper shipping name

Not applicable.

14.3. Transport hazard class(es)

No transport warning sign required.

14.4. Packing group

Not applicable.

14.5. Environmental hazards

Environmentally hazardous substance/marine pollutant
No.

14.6. Special precautions for user

N-Ethyl-N-[(Heptadecafluorooctyl)Sulphonyl]Glycine

Not applicable.

14.7. Transport in bulk according to Annex II of MARPOL and the IBC Code

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable.

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations Health and Safety at Work etc. Act 1974 (as amended).
The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (SI 2009 No. 1348) (as amended) ["CDG 2009"].
EH40/2005 Workplace exposure limits.

EU legislation Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) (as amended).
Commission Regulation (EU) No 2015/830 of 28 May 2015.
Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures (as amended).

15.2. Chemical safety assessment

No chemical safety assessment has been carried out.

SECTION 16: Other information

Abbreviations and acronyms used in the safety data sheet
ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road.
ADN: European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways.
RID: European Agreement concerning the International Carriage of Dangerous Goods by Rail.
IATA: International Air Transport Association.
ICAO: Technical Instructions for the Safe Transport of Dangerous Goods by Air.
IMDG: International Maritime Dangerous Goods.
CAS: Chemical Abstracts Service.
ATE: Acute Toxicity Estimate.
LC_{50}: Lethal Concentration to 50 % of a test population.
LD_{50}: Lethal Dose to 50% of a test population (Median Lethal Dose).
EC_{50}: 50% of maximal Effective Concentration.
PBT: Persistent, Bioaccumulative and Toxic substance.
vPvB: Very Persistent and Very Bioaccumulative.

Training advice Only trained personnel should use this material.

Revision date 25/05/2020

Revision 1

Hazard statements in full H315 Causes skin irritation.
H319 Causes serious eye irritation.
H335 May cause respiratory irritation.

This information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process. Such information is, to the best of the company's knowledge and belief, accurate and reliable as of the date indicated. However, no warranty, guarantee or representation is made to its accuracy, reliability or completeness. It is the user's responsibility to satisfy himself as to the suitability of such information for his own particular use.

Toronto Research Chemicals
products for innovative research

Safety Data Sheet - Version 5.0

Preparation Date 8/1/2019
Latest Revision Date (If Revised)
SDS Expiry Date 7/30/2022

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product Identifier

Chemical Name N-Methylperfluoro-1-octanesulfonamidoacetic Acid

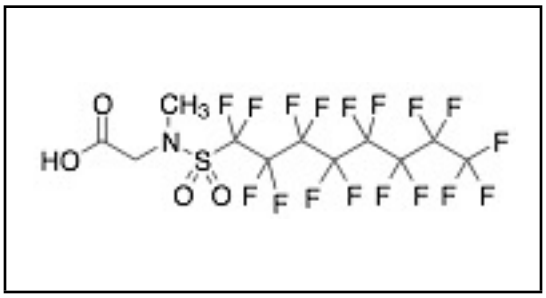
Catalogue # M320055

1.2 Relevant Identified Uses of the Substance or Mixture and Uses Advised Against

Product Uses To be used only for scientific research and development. Not for use in humans or animals.

1.3 Details of the Supplier of the Safety Data Sheet

Company Toronto Research Chemicals
2 Brisbane Road
Toronto, ON M3J 2J8
CANADA
Telephone +14166659696
FAX +14166654439
Email orders@trc-canada.com



1.4 Emergency Telephone Number

Emergency# +1(416) 665-9696 between 0800-1700 (GMT-5)

2. HAZARDS IDENTIFICATION

2.1/2.2 Classification of the Substance or Mixture and Label Elements

GHS Hazards Classification (According to EU Regulation 1272/2008 and US OSHA 1910.1200)

Hazardous to the Aquatic Environment, Long-Term Hazard (Category 4)

GHS Hazards Identification (According to EU Regulation 1272/2008 and US OSHA 1910.1200)

Signal Word

GHS Hazard Statements

H413 May cause long lasting harmful effects to aquatic life.

GHS Precautionary Statements

P273 Avoid release to the environment.

2.3 Unclassified Hazards/Hazards Not Otherwise Classified

No data available.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Molecular Formula: $C_{11}H_6F_{17}NO_4S$ **Molecular Weight:** 571.21

CAS Registry #: 2355-31-9 **EC#:**

Synonyms

N-[(1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-Heptadecafluorooctyl)sulfonyl]-N-methylglycine;
2-(N-Methyl-perfluorooctane sulfonamido) Acetate;
2-(N-Methylperfluorooctanesulfoamido)acetic Acid;
2-(N-Methylperfluorooctanesulfonamido)acetic Acid;
Me-PFOSA-AcOH;
N-Me-PFOSAA; N-[(heptadecafluorooctyl)sulfonyl]-sarcosine; N-[(heptadecafluorooctyl)sulfonyl]-N-methyl-glycine

3.2 Mixtures

Not a mixture.

4. FIRST AID MEASURES

4.1 Description of First Aid Measures

General Advice

If medical attention is required, show this safety data sheet to the doctor.

If Inhaled

If inhaled, move person to fresh air. If not breathing, give artificial respiration and consult a physician.

In Case of Skin Contact

Wash affected area with soap and water. Consult a physician if any exposure symptoms are observed.

In Case of Eye Contact

Immediately rinse eyes with plenty of water for at least 15 minutes. Consult a physician.

If Swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Do NOT induce vomiting unless advised to do so by a physician or Poison Control Center. Seek medical attention.

4.2 Most Important Symptoms and Effects, Both Acute and Delayed

The most important known symptoms and effects are described in the labeling (see section 2.2) and/or section 11.

4.3 Indication of any Immediate Medical Attention and Special Treatment Needed

No data available.

5. FIREFIGHTING MEASURES

5.1 Extinguishing Media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special Hazards Arising from the Substance or Mixture

Carbon oxides, Nitrogen oxides, Sulfur oxides, Hydrogen fluoride

5.3 Advice for Firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further Information

No data available.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

Method and materials for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.

7.2 Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place.
Keep in a dry place.

Storage conditions: -20°C Freezer, Under inert atmosphere

7.3 Specific End Uses

For scientific research and development only. Not for use in humans or animals.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control Parameters

Contains no components with established occupational exposure limits.

8.2 Exposure Controls

Appropriate Engineering Controls

A laboratory fumehood or other appropriate form of local exhaust ventilation should be used to avoid exposure.

Personal Protective Equipment

All recommendations below are advisory in nature and a risk assessment should be performed by the employer/end user prior to use of this product. The type of protective equipment must be selected based on the amount and concentration of the dangerous material being used in the workplace.

Eye/Face Protection

Safety goggles or face shield. All equipment should have been tested and approved under appropriate standards, such as NIOSH (US), CSA (Canada), or EN 166 (EU).

Skin Protection

Gloves should be used when handling this material. Gloves are to be inspected prior to use. Contaminated gloves are to be removed using proper glove removal technique so that the outer surface of the glove does not contact bare skin. Dispose of contaminated gloves after use in compliance with good laboratory practices and local requirements.

Gloves used for incidental exposures (splash protection) should be designated as “chemical resistant” by EU standard EN 374 with the resistance codes corresponding to the anticipated use of the material. Unrated gloves are not recommended.
Suggested gloves: AnsellPro Sol-Vex nitrile gloves style 37-175, 15 mil thickness.
Penetration time has not been determined.

Gloves used for prolonged direct exposure (immersion) should be designated “chemical resistant” as per EN 734 with the resistance codes corresponding to the anticipated use of the material.
Suggested gloves: AnsellPro Viton/Butyl gloves style 38-612, 4/8 mil thickness.
Penetration time has not been determined.

These recommendations may not apply if the material is mixed with any other chemical, or dissolved into a solution. A risk assessment must be performed to ensure the gloves will still offer acceptable protection.

Body Protection

Fire resistant (Nomex) lab coat or coveralls.

Respiratory Protection

Recommended respirators are NIOSH-approved N100 or CEN-approved FFP3 particulate respirators. These are to be only used as a backup to local exhaust ventilation or other engineering controls. If the respirator is the only means of protection, a full-face supplied air respirator must be used.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on Basic Physical and Chemical Properties

A) Appearance
White to Off-White Solid

B) Odour
No data available

C) Odour Threshold
No data available

D) pH
No data available

E) Melting Point/Freezing Point
142 - 144°C

F) Initial Boiling Point/Boiling Range
No data available

G) Flash point
No data available

H) Evaporation Rate
No data available

I) Flammability (Solid/Gas)
No data available

J) Upper/Lower Flammability/Explosive Limits
No data available

K) Vapour Pressure
No data available

L) Vapour Density
No data available

M) Relative Density
No data available

N) Solubility
DMSO (Slightly), Methanol (Slightly)

O) Partition Coefficient: n-octanol/water

P) Auto-Ignition Temperature

No data available

Q) Decomposition Temperature
No data available

R) Viscosity
No data available

S) Explosive Properties
No data available

T) Oxidizing Properties
No data available

9.2 Other Information
no data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available.

10.2 Chemical Stability
Stable under recommended storage conditions.

10.3 Possibility of Hazardous Reactions
No data available.

10.4 Conditions to Avoid
No data available.

10.5 Incompatible Materials
Strong oxidizing agents.

10.6 Hazardous Decomposition Products
In the event of fire: See section 5. **Other decomposition products:** No data available.

11. TOXICOLOGICAL INFORMATION

11.1 Information on Toxicological Effects

A) Acute Toxicity
Oral LD50: No data available.
Dermal LD50: No data available.
Inhalation LC50: No data available.

B) Skin Corrosion/Irritation
No data available

C) Serious Eye Damage/Irritation
No data available

D) Respiratory or Skin Sensitization
No data available

E) Germ Cell Mutagenicity
No data available

F) Carcinogenicity
No data available

G) Reproductive Toxicity/Teratogenicity
No data available

H) Single Target Organ Toxicity - Single Exposure
No data available

I) Single Target Organ Toxicity - Repeated Exposure
No data available

J) Aspiration Hazard
No data available

K) Potential Health Effects and Routes of Exposure

Inhalation
May be harmful if inhaled. May cause respiratory tract irritation.

Ingestion
May be harmful if swallowed.

Skin
May be harmful if absorbed through skin. May cause skin irritation.

Eyes
May cause eye irritation.

L) Signs and Symptoms of Exposure

The most important known symptoms and effects are described in the labeling (see section 2.2) and/or section 11.

To the best of our knowledge, the chemical, physical, and toxicological properties of this material have not been thoroughly investigated.

M) Additional Information

RTECS: Not available.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

No data available.

12.2 Persistance and Degradability

No data available.

12.3 Bioaccumulative Potential

No data available.

12.4 Mobility in Soil

No data available.

12.5 Results of PBT and vPvB Assessment

No data available.

12.6 Other Adverse Effects

No data available.

13. DISPOSAL CONSIDERATIONS

13.1 Waste Treatment Methods

A) Product

Product may be burned in an incinerator equipped with afterburner and scrubber. Excess and expired materials are to be offered to a licensed hazardous material disposal company. Ensure that all Federal and Local regulations regarding the disposal and destruction of this material are followed.

B) Contaminated Packaging

Dispose of as above.

C) Other Considerations

Product is not to be disposed of in sanitary sewers, storm sewers, or landfills.

14. TRANSPORT INFORMATION

14.1 UN Number

DOT (US): N/A IATA: N/A IMDG: N/A ADR/RID: N/A

14.2 UN Proper Shipping Name

DOT (US)/IATA:

Not dangerous goods

IMDG/ARD/RID:

Not dangerous goods

14.3 Transport Hazard Class(es)

DOT (US): N/A IATA: N/A IMDG: N/A ADR/RID: N/A

14.4 Packing Group

DOT (US): N/A IATA: N/A IMDG: N/A ADR/RID: N/A

14.5 Environmental Hazards

DOT (US): None IATA: None IMDG: None ADR/RID: None

14.6 Special Precautions for User

None

15. REGULATORY INFORMATION

This safety data sheet complies with the requirements of WHMIS (Canada), OSHA 1910.1200 (US), and EU Regulation EC No. 1907/2006 (European Union).

15.1 Safety, Health and Environmental Regulations/Legislation Specific for the Substance or Mixture

A) Canada

DSL/NDSL Status: This product is not listed on the Canadian DSL/NDSL.

B) United States

TSCA Status: This product is not listed on the US EPA TSCA.

C) European Union

ECHA Status: This product is not registered with the EU ECHA.

15.2 Chemical Safety Assessment

No data available

16. OTHER INFORMATION

16.1 Revision History

Original Publication Date: 8/1/2019

16.2 List of Abbreviations

LD50	Median lethal dose of a substance required to kill 50% of a test population.
LC50	Medial lethal concentration of a substance required to kill 50% of a test population.
LDLo	Lowest known lethal dose
TDLo	Lowest known toxic dose
IARC	International Agency for Research on Cancer
NTP	National Toxicology Program
RTECS	Registry of Toxic Effects of Chemical Substances

16.3 Further Information

 The above information is believed to be correct to the best of our knowledge, but is to be only used as a guide. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. Please take all due care when handling this product.

TCI AMERICA

SAFETY DATA SHEET

Revision number: 3
Revision date: 08/15/2016

1. IDENTIFICATION

Product name: Nonafluoro-1-butanesulfonic Acid
Product code: N0709

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborgate Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

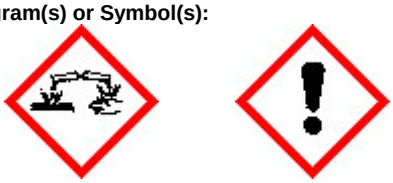
2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:
Acute Toxicity - Oral [Category 4]
Eye Damage/Irritation [Category 1]
Corrosive to Metals [Category 1]
Skin Corrosion/Irritation [Category 1C]

Signal word: Danger!

Hazard Statement(s):
Causes serious eye damage
Causes severe skin burns and eye damage
Harmful if swallowed
May be corrosive to metals

Pictogram(s) or Symbol(s):



Precautionary Statement(s):

[Prevention] Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Do not breathe dusts or mists. Use only outdoors or in a well-ventilated area. Wear protective gloves, protective clothing, eye protection and face protection. Wear eye protection. Wear face protection (full length face shield). Keep only in original container.

[Response] If swallowed: Immediately call a poison center or doctor. Rinse mouth. If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Absorb spillage to prevent material damage.

[Storage] Store locked up. Store in corrosive resistant container with a resistant inner liner.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance
Components: Nonafluoro-1-butanesulfonic Acid
Percent: >98.0%(T)
CAS Number: 375-73-5
Molecular Weight: 300.09
Chemical Formula: $C_4HF_9O_3S$
Synonyms: Perfluoro-1-butanesulfonic Acid

4. FIRST-AID MEASURES

Inhalation: Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact: For severe burns, immediate medical attention is required. Immediately call a poison center or doctor. Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Eye contact: IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Eye contact with vapors or substance may cause severe injury, burns, or death. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Harmful if swallowed. Do not induce vomiting with out medical advice. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: Pain. Redness.
Delayed: No data available

Immediate medical attention: WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is harmful. WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is corrosive. For severe burns, immediate medical attention is required. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO_2 or water spray. Consult with local fire authorities before attempting large scale fire fighting operations.

Specific hazards arising from the chemical
Hazardous combustion products: These products include: Carbon oxides Sulfur oxides Halogenated compounds
Other specific hazards: WARNING: Highly toxic HF gas is produced during combustion.

Special precautions for fire-fighters:
Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.
Special protective equipment for fire-fighters:
Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

6. ACCIDENTAL RELEASE MEASURES

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

Emergency procedures: In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:
ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Ventilate the area.

Environmental precautions:
Keep away from living quarters. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Do NOT breath gas, fumes, vapor, or spray. Manipulate under an adequate fume hood. Do not ingest. Avoid contact with skin and eyes. May corrode metallic surfaces. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Store in corrosive resistant container with a resistant inner liner. Keep containers tightly closed in a cool, well-ventilated place. Store locked up. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods. Store under inert gas (e.g. Argon). Hygroscopic material, store in a tightly sealed container.

Storage incompatibilities: Acids, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

Appropriate engineering controls:
Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection: Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection: Nitrile gloves.
Eye protection: Wear eye protection (splash goggles) and face protection (full length face shield).
Skin and body protection: Wear protective clothing (lab coat and chemical resistant boots).

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid
Form: Clear
Color: Colorless - Very pale yellow
Odor: No data available
Odor threshold: No data available

Melting point/freezing point: No data available
Boiling point/range: 212°C (414°F)
Decomposition temperature: No data available
Relative density: No data available
Kinematic Viscosity: No data available

Partition coefficient: n-octanol/water (log P_{ow}) No data available

Flash point: No data available
Flammability (solid, gas): No data available

pH: No data available
Vapor pressure: No data available
Vapor density: No data available
Dynamic Viscosity: No data available

Evaporation rate: (Butyl Acetate = 1) No data available

Autoignition temperature: No data available
Flammability or explosive limits:
Lower: No data available
Upper: No data available

Solubility(ies):
Water: Soluble
Soluble: Acetonitrile

9. PHYSICAL AND CHEMICAL PROPERTIES

Very slightly soluble: Toluene, Heptane

10. STABILITY AND REACTIVITY

Reactivity: Corrodes in contact with metals.
Chemical Stability: Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions: No hazardous reactivity has been reported.
Conditions to avoid: Avoid excessive heat and light.
Incompatible materials: Oxidizing agents
Hazardous Decomposition Products: No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: EK5930000

Acute Toxicity:
orl-rat LD50:430 mg/kg

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
No data available

Carcinogenicity:

No data available

IARC: No data available **NTP:** No data available **OSHA:** No data available

Reproductive toxicity:
No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.
Symptoms related to exposure:
Overexposure may result in serious illness or death. Skin contact may produce burrns. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Eye contact can result in corneal damage or blindness.
Potential Health Effects:
No specific information available; skin and eye contact may result in irriatation. May be harmful if inhaled or ingested.
Target organ(s): No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity

Fish: No data available
Crustacea: No data available
Algae: No data available

Persistence and degradability: No data available
Bioaccumulative potential (BCF): No data available
Mobillity in soil: No data available
Partition coefficient: No data available
n-octanol/water (log P_{ow})
Soil adsorption (Koc): No data available
Henry's Law: No data available
constant (PaM^3/mol)

13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.

Disposal of container: Dispose of as unused product. Do not re-use empty containers.

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2586	Alkyl sulfonic acids, liquid	8 Corrosive material	III

IATA

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2586	Alkylsulfonic acids, liquid	8 Corrosive material	III

IMDG

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2586	Alkylsulphonic acids, liquid	8 Corrosive material	III

EmS number: F-A, S-B

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):
This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313: Not Listed
SARA 302: Not Listed

State Regulations

State Right-to-Know

Massachusetts Not Listed
New Jersey Not Listed
Pennsylvania Not Listed
California Proposition 65: Not Listed

Other Information

NFPA Rating:

Health: 3
Flammability: 0
Instability: 0

HMIS Classification:

Health: 3
Flammability: 0
Physical: 0

International Inventories

WHMIS hazard class: E: Corrosive material.
D2A: Materials causing other toxic effects. (Very Toxic)
Canada: NDSL On NDSL
EC-No: 206-793-1

16. OTHER INFORMATION

Revision date: 08/15/2016
Revision number: 3

16. OTHER INFORMATION

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

TCI AMERICA

SAFETY DATA SHEET

Revision number: 3
Revision date: 08/18/2015

1. IDENTIFICATION

Product name: Heptafluorobutyric Acid (ca. 0.5mol/L in Water) [Ion-Pair Reagent for LC-MS]
Product code: A5713

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborgate Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:
Eye Damage/Irritation [Category 1]
Corrosive to Metals [Category 1]
Skin Corrosion/Irritation [Category 1B]

Signal word: Danger!

Hazard Statement(s):
Causes serious eye damage
Causes severe skin burns and eye damage
May be corrosive to metals

Pictogram(s) or Symbol(s):

Precautionary Statement(s):

[Prevention] Do not breathe dusts or mists. Use only outdoors or in a well-ventilated area. Wear protective gloves, protective clothing, eye protection and face protection. Wear eye protection. Wear face protection (full length face shield). Keep only in original container.

[Response] If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Absorb spillage to prevent material damage.

[Storage] Store locked up. Store in corrosive resistant container with a resistant inner liner.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Mixture

3. COMPOSITION/INFORMATION ON INGREDIENTS

Components: Heptafluorobutyric Acid (ca. 0.5mol/L in Water) [Ion-Pair Reagent for LC-MS]
Percent: ....
CAS Number: 375-22-4
Molecular Weight: 214.04
Chemical Formula: $C_4HF_7O_2$
Synonyms: IPC-PFFA-4 (ca. 0.5mol/L in Water) , Perfluorobutyric Acid (ca. 0.5mol/L in Water)

4. FIRST-AID MEASURES

Inhalation: Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact: For severe burns, immediate medical attention is required. Immediately call a poison center or doctor. Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Eye contact: IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Eye contact with vapors or substance may cause severe injury, burns, or death. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Do not induce vomiting with out medical advice. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: Pain. Redness.
Delayed: No data available

Immediate medical attention: WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is corrosive. For severe burns, immediate medical attention is required. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO_2 or water spray. Consult with local fire authorities before attempting large scale fire fighting operations.

Specific hazards arising from the chemical
Hazardous combustion products: These products include: Carbon oxides Halogenated compounds
Other specific hazards: WARNING: Highly toxic HF gas is produced during combustion.

Special precautions for fire-fighters:
Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.
Special protective equipment for fire-fighters:
Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures: In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:
ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Ventilate the area.
Environmental precautions:
Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Do NOT breath gas, fumes, vapor, or spray. Manipulate under an adequate fume hood. Avoid contact with skin and eyes. May corrode metallic surfaces. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Store in corrosive resistant container with a resistant inner liner. Keep containers tightly closed in a cool, well-ventilated place. Store locked up. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Bases, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

Appropriate engineering controls:
Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection: Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection: Nitrile gloves.
Eye protection: Wear eye protection (splash goggles) and face protection (full length face shield).
Skin and body protection: Wear protective clothing (lab coat and chemical resistant boots).

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid
Form: Clear
Color: Colorless
Odor: No data available
Odor threshold: No data available

Melting point/freezing point:	No data available	**pH:**	No data available
Boiling point/range:	No data available	**Vapor pressure:**	No data available
Decomposition temperature:	No data available	**Vapor density:**	No data available
Relative density:	No data available	**Dynamic Viscosity:**	No data available
Kinematic Viscosity:	No data available		
Partition coefficient: n-octanol/water (log P_{ow})	No data available	**Evaporation rate:** (Butyl Acetate = 1)	No data available
Flash point:	No data available	**Autoignition temperature:**	No data available
Flammability (solid, gas):	No data available	**Flammability or explosive limits:**	
		Lower:	No data available
		Upper:	No data available

Solubility(ies):

10. STABILITY AND REACTIVITY

Reactivity: Corrodes in contact with metals.
Chemical Stability: Stable under recommended storage conditions. (See Section 7)

10. STABILITY AND REACTIVITY

Possibility of Hazardous Reactions: No hazardous reactivity has been reported.
Conditions to avoid: Avoid excessive heat and light.
Incompatible materials: Oxidizing agents
Hazardous Decomposition Products: No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: ET4025000

Acute Toxicity:
ipr-mus LD50:68 uL/kg ivn-rbt LD:>10 uL/kg

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
No data available

Carcinogenicity:

No data available

IARC: No data available **NTP:** No data available **OSHA:** No data available

Reproductive toxicity:
No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.
Symptoms related to exposure:
Skin contact may produce burrns. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Eye contact can result in corneal damage or blindness.
Potential Health Effects:
No specific information available; skin and eye contact may result in irriatation. May be harmful if inhaled or ingested.
Target organ(s): No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity
Fish: No data available
Crustacea: No data available
Algae: No data available

Persistence and degradability: No data available
Bioaccumulative potential (BCF): No data available
Mobillity in soil: No data available
Partition coefficient: No data available
n-octanol/water (log P_{ow})
Soil adsorption (Koc): No data available
Henry's Law: No data available
constant (PaM^3/mol)

13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.

Disposal of container: Dispose of as unused product. Do not re-use empty containers.

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

DOT (US)

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3265	Corrosive liquid, acidic, organic, n.o.s.	8 Corrosive material	II

IATA

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3265	Corrosive liquid, acidic, organic, n.o.s.	8 Corrosive material	II

IMDG

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3265	Corrosive liquid, acidic, organic, n.o.s.	8 Corrosive material	II

EmS number: F-A, S-B

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):
This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313: Not Listed
SARA 302: Not Listed

State Regulations

State Right-to-Know

Massachusetts Not Listed
New Jersey Not Listed
Pennsylvania Not Listed
California Proposition 65: Not Listed

Other Information

NFPA Rating:

Health: 3
Flammability: 0
Instability: 0

HMIS Classification:

Health: 3
Flammability: 0
Physical: 0

International Inventories

WHMIS hazard class: E: Corrosive material.
EC-No: 206-786-3

16. OTHER INFORMATION

Revision date: 08/18/2015
Revision number: 3

16. OTHER INFORMATION

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

TCI AMERICA

SAFETY DATA SHEET

Revision number: 3
Revision date: 10/17/2016

1. IDENTIFICATION

Product name: Nonadecafluorodecanoic Acid
Product code: N0607

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborgate Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:
Acute Toxicity - Oral [Category 3]
Eye Damage/Irritation [Category 1]
Skin Corrosion/Irritation [Category 1B]

Signal word: Danger!

Hazard Statement(s):
Causes serious eye damage
Causes severe skin burns and eye damage
Toxic if swallowed

Pictogram(s) or Symbol(s):


Precautionary Statement(s):

[Prevention] Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Do not breathe dusts or mists. Use only outdoors or in a well-ventilated area. Wear protective gloves, protective clothing, eye protection and face protection. Wear eye protection. Wear face protection (full length face shield).

[Response] If swallowed: Immediately call a poison center or doctor. Rinse mouth. If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

[Storage] Store locked up.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance
Components: Nonadecafluorodecanoic Acid
Percent: >98.0%(T)
CAS Number: 335-76-2
Molecular Weight: 514.09
Chemical Formula: $C_{10}HF_{19}O_2$
Synonyms: Perfluorodecanoic Acid

4. FIRST-AID MEASURES

Inhalation: Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact: For severe burns, immediate medical attention is required. Immediately call a poison center or doctor. Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Eye contact: IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Eye contact with vapors or substance may cause severe injury, burns, or death. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Toxic if swallowed. Do not induce vomiting with out medical advice. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: Pain. Redness.
Delayed: No data available

Immediate medical attention: WARNING: It might be dangerous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is toxic. WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is corrosive. For severe burns, immediate medical attention is required. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO_2 or water spray. Consult with local fire authorities before attempting large scale fire fighting operations.

Specific hazards arising from the chemical
Hazardous combustion products: These products include: Carbon oxides Halogenated compounds
Other specific hazards: WARNING: Highly toxic HF gas is produced during combustion.

Special precautions for fire-fighters:
Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.
Special protective equipment for fire-fighters:
Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures: Prevent dust cloud. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:
ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material.
Environmental precautions:
Keep away from living quarters. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid inhalation of vapor or mist. Manipulate under an adequate fume hood. Do not ingest. Avoid contact with skin and eyes. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Store locked up. Keep containers tightly closed in a cool, well-ventilated place. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Combustible substances, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

Appropriate engineering controls:
Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection: Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection: Nitrile gloves.
Eye protection: Safety glasses.
Skin and body protection: Wear protective clothing (lab coat and chemical resistant boots).

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Solid
Form: Crystal - Powder
Color: White - Almost white
Odor: No data available
Odor threshold: No data available

Melting point/freezing point:	88°C (190°F)	**pH:**	No data available
Boiling point/range:	145°C (293°F)/13kPa	**Vapor pressure:**	<1.3kPa/0°C
Decomposition temperature:	No data available	**Vapor density:**	No data available
Relative density:	No data available	**Dynamic Viscosity:**	No data available
Kinematic Viscosity:	No data available		
Partition coefficient: n-octanol/water (log P_{ow})	No data available	**Evaporation rate:** (Butyl Acetate = 1)	No data available
Flash point:	No data available	**Autoignition temperature:**	No data available
Flammability (solid, gas):	No data available	**Flammability or explosive limits:**	
		Lower:	No data available
		Upper:	No data available

Solubility(ies):

10. STABILITY AND REACTIVITY

Reactivity: Not Available.
Chemical Stability: Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions: No hazardous reactivity has been reported.

10. STABILITY AND REACTIVITY

Conditions to avoid: Avoid excessive heat and light.
Incompatible materials: Alkali, Bases, Oxidizing agents, Reducing agents
Hazardous Decomposition Products: No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: HD9900000

Acute Toxicity:
ipr-mus LD50:150 mg/kg ipr-rat LD50:40 mg/kg

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
No data available

Carcinogenicity:

No data available

IARC: No data available **NTP:** No data available **OSHA:** No data available

Reproductive toxicity:
No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.
Symptoms related to exposure:
Overexposure may result in serious illness or death. Skin contact may produce burrns. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Eye contact can result in corneal damage or blindness.
Potential Health Effects:
No specific information available; skin and eye contact may result in irriatation. May be harmful if inhaled or ingested.
Target organ(s): No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity
Fish: No data available
Crustacea: No data available
Algae: No data available

Persistence and degradability: No data available
Bioaccumulative potential (BCF): No data available
Mobillity in soil: No data available
Partition coefficient: No data available
n-octanol/water (log P_{ow})
Soil adsorption (Koc): No data available
Henry's Law: No data available
constant (PaM^3/mol)

13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.

13. DISPOSAL CONSIDERATIONS

Disposal of container: Dispose of as unused product. Do not re-use empty containers.
Other considerations: Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)

UN number:	Proper Shipping Name:	Class or Division:	Subrisk(s):	Packing Group:
UN2923	Corrosive solids, toxic, n.o.s.	8 Corrosive material	6.1 Toxic material.	II

IATA

UN number:	Proper Shipping Name:	Class or Division:	Subrisk(s):	Packing Group:
UN2923	Corrosive solid, toxic, n.o.s.	8 Corrosive material	6.1 Toxic material.	II

IMDG

UN number:	Proper Shipping Name:	Class or Division:	Subrisk(s):	Packing Group:
UN2923	Corrosive solid, toxic, n.o.s.	8 Corrosive material	6.1 Toxic material.	II

EmS number: F-A, S-B

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):
This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313: Not Listed
SARA 302: Not Listed

State Regulations

State Right-to-Know

Massachusetts Not Listed
New Jersey Not Listed
Pennsylvania Not Listed
California Proposition 65: Not Listed

Other Information

NFPA Rating:

Health: 2
Flammability: 0
Instability: 0

HMIS Classification:

Health: 2
Flammability: 0
Physical: 0

International Inventories

WHMIS hazard class: E: Corrosive material.
D1B: Materials causing immediate and serious toxic effects. (Toxic)
EC-No: 206-400-3

16. OTHER INFORMATION

Revision date: 10/17/2016
Revision number: 3
TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

TCI AMERICA

SAFETY DATA SHEET

Revision number: 3
Revision date: 10/06/2014

1. IDENTIFICATION

Product name: Tricosafluorododecanoic Acid
Product code: T2492

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborgate Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

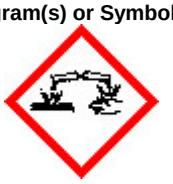
2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:
Eye Damage/Irritation [Category 1]
Corrosive to Metals [Category 1]
Aquatic Hazard (Acute) [Category 3]
Aquatic Hazard (Long-Term) [Category 3]
Skin Corrosion/Irritation [Category 1B]

Signal word: Danger!

Hazard Statement(s):
Causes serious eye damage
Causes severe skin burns and eye damage
May be corrosive to metals
Harmful to aquatic life
Harmful to aquatic life with long lasting effects

Pictogram(s) or Symbol(s):



Precautionary Statement(s):

[Prevention] Do not breathe dusts or mists. Use only outdoors or in a well-ventilated area. Wear protective gloves, protective clothing, eye protection and face protection. Wear eye protection. Wear face protection (full length face shield). Keep only in original container.

[Response] If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Absorb spillage to prevent material damage.

[Storage] Store locked up. Store in corrosive resistant container with a resistant inner liner.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance
Components: Tricosafluorododecanoic Acid
Percent: >92.0%(GC)
CAS Number: 307-55-1
Molecular Weight: 614.10
Chemical Formula: $C_{12}HF_{23}O_2$
Synonyms: Perfluorododecanoic Acid , Tricosafluorolauric Acid , Perfluorolauric Acid

4. FIRST-AID MEASURES

Inhalation: Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact: For severe burns, immediate medical attention is required. Immediately call a poison center or doctor. Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Eye contact: IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Eye contact with vapors or substance may cause severe injury, burns, or death. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Do not induce vomiting with out medical advice. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: Pain. Redness.
Delayed: No data available

Immediate medical attention: WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is corrosive. For severe burns, immediate medical attention is required. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO_2 or water spray. Consult with local fire authorities before attempting large scale fire fighting operations.

Specific hazards arising from the chemical
Hazardous combustion products: These products include: Carbon oxides Halogenated compounds
Other specific hazards: WARNING: Highly toxic HF gas is produced during combustion.

Special precautions for fire-fighters:
Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.
Special protective equipment for fire-fighters:
Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures: Prevent dust cloud. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:
ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material. Ventilate the area.

Environmental precautions:
Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid inhalation of vapor or mist. Manipulate under an adequate fume hood. Avoid contact with skin and eyes. May corrode metallic surfaces. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Store in corrosive resistant container with a resistant inner liner. Keep containers tightly closed in a cool, well-ventilated place. Store locked up. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Bases, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

Appropriate engineering controls:
Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection: Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection: Wear protective gloves.
Eye protection: Safety glasses.
Skin and body protection: Lab coat.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Solid
Form: Crystal - Powder
Color: White - Almost white
Odor: No data available
Odor threshold: No data available

Melting point/freezing point:	110°C (230°F)	**pH:**	No data available
Boiling point/range:	245°C (473°F)	**Vapor pressure:**	No data available
Decomposition temperature:	No data available	**Vapor density:**	No data available
Relative density:	No data available	**Dynamic Viscosity:**	No data available
Kinematic Viscosity:	No data available		
Partition coefficient: n-octanol/water (log P_{ow})	10.16	**Evaporation rate:** (Butyl Acetate = 1)	No data available
Flash point:	No data available	**Autoignition temperature:**	No data available
Flammability (solid, gas):	No data available	**Flammability or explosive limits:**	
		Lower:	No data available
		Upper:	No data available

Solubility(ies):
Water: Insoluble
Soluble: Methanol

10. STABILITY AND REACTIVITY

10. STABILITY AND REACTIVITY

Reactivity: Corrodes in contact with metals.
Chemical Stability: Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions: No hazardous reactivity has been reported.
Conditions to avoid: Avoid excessive heat and light.
Incompatible materials: Alkali, Bases, Oxidizing agents
Hazardous Decomposition Products: No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: JR3740000

Acute Toxicity:
No data available

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
No data available

Carcinogenicity:

No data available

IARC: No data available **NTP:** No data available **OSHA:** No data available

Reproductive toxicity:
orl-rat TDLo:22 mg/kg(110D male)

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.
Symptoms related to exposure:
Skin contact may produce burrns. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Eye contact can result in corneal damage or blindness.
Potential Health Effects:
No specific information available; skin and eye contact may result in irriatation. May be harmful if inhaled or ingested.
Target organ(s): No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity
Fish: 96h LC50:>0.500 mg/L (Oryzias latipes)
Crustacea: 48h EC50:0.129 mM (Daphnia magna)
Algae: No data available

Persistence and degradability: -16 - -11 % (by BOD), 1 - 2 % (by HPLC)
Bioaccumulative potential (BCF): 16000 (conc. 1 ug/L), 10000 (conc. 0.1 ug/L)
Mobillity in soil: No data available
Partition coefficient: 10.16
n-octanol/water (log P_{ow})
Soil adsorption (Koc): No data available
Henry's Law: 7×10^6
constant (PaM^3/mol)

13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.

Disposal of container: Dispose of as unused product. Do not re-use empty containers.

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3261	Corrosive solid, acidic, organic, n.o.s.	8 Corrosive material	II

IATA

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3261	Corrosive solid, acidic, organic, n.o.s.	8 Corrosive material	II

IMDG

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3261	Corrosive solid, acidic, organic, n.o.s.	8 Corrosive material	II

EmS number: F-A, S-B

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):
This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313: Not Listed
SARA 302: Not Listed

State Regulations

State Right-to-Know

Massachusetts Not Listed
New Jersey Not Listed
Pennsylvania Not Listed
California Proposition 65: Not Listed

Other Information

NFPA Rating:

Health: 2
Flammability: 0
Instability: 0

HMIS Classification:

Health: 2
Flammability: 0
Physical: 0

International Inventories

WHMIS hazard class: E: Corrosive material.
EC-No: 206-203-2

16. OTHER INFORMATION

Revision date: 10/06/2014
Revision number: 3

16. OTHER INFORMATION

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

Toronto Research Chemicals
products for innovative research

Safety Data Sheet - Version 5.0

Preparation Date 8/24/2016
Latest Revision Date (If Revised) 6/12/2020
SDS Expiry Date 6/11/2023

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product Identifier

Chemical Name Perfluorodecane Sulfonic Acid

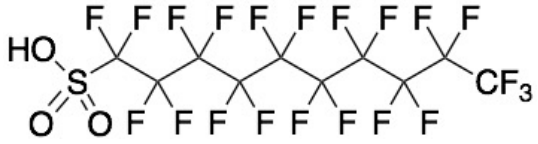
Catalogue # P286540

1.2 Relevant Identified Uses of the Substance or Mixture and Uses Advised Against

Product Uses To be used only for scientific research and development. Not for use in humans or animals.

1.3 Details of the Supplier of the Safety Data Sheet

Company Toronto Research Chemicals
2 Brisbane Road
Toronto, ON M3J 2J8
CANADA
Telephone +14166659696
FAX +14166654439
Email orders@trc-canada.com



1.4 Emergency Telephone Number

Emergency# +1(416) 665-9696 between 0800-1700 (GMT-5)

2. HAZARDS IDENTIFICATION

2.1/2.2 Classification of the Substance or Mixture and Label Elements

GHS Hazards Classification (According to EU Regulation 1272/2008 and US OSHA 1910.1200)

Skin Irritation (Category 2)
Eye Damage/Irritation (Category 2A)
Specific Target Organ Toxicity, Single Exposure; Respiratory Tract Irritation (Category 3)

GHS Hazards Identification (According to EU Regulation 1272/2008 and US OSHA 1910.1200)

Signal Word Warning

GHS Hazard Statements

H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.

GHS Precautionary Statements

P261	Avoid breathing dust/fume/gas/mist/vapours/spray
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P305/P351/P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

2.3 Unclassified Hazards/Hazards Not Otherwise Classified

No data available.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Molecular Formula: $C_{10}HF_{21}O_3S$ **Molecular Weight:** 600.14
CAS Registry #: 335-77-3 **EC#:** 206-401-9

Synonyms

1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-Heneicosafluoro-1-decanesulfonic Acid 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-Henicosafluorodecane-1-sulfonate

3.2 Mixtures

Not a mixture.

4. FIRST AID MEASURES

4.1 Description of First Aid Measures

General Advice
If medical attention is required, show this safety data sheet to the doctor.

If Inhaled
If inhaled, move person to fresh air. If not breathing, give artificial respiration and consult a physician.

In Case of Skin Contact
Wash affected area with soap and water. Consult a physician if any exposure symptoms are observed.

In Case of Eye Contact
Immediately rinse eyes with plenty of water for at least 15 minutes. Consult a physician.

If Swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Do NOT induce vomiting unless advised to do so by a physician or Poison Control Center. Seek medical attention.

4.2 Most Important Symptoms and Effects, Both Acute and Delayed

The most important known symptoms and effects are described in the labeling (see section 2.2) and/or section 11.

4.3 Indication of any Immediate Medical Attention and Special Treatment Needed

No data available.

5. FIREFIGHTING MEASURES

5.1 Extinguishing Media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special Hazards Arising from the Substance or Mixture

Carbon oxides, Sulfur oxides, Hydrogen fluoride

5.3 Advice for Firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further Information

No data available.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

Method and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.

7.2 Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.
Keep in a dry place.

Storage conditions: Hygroscopic, -20°C Freezer, Under inert atmosphere

7.3 Specific End Uses

For scientific research and development only. Not for use in humans or animals.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control Parameters

Contains no components with established occupational exposure limits.

8.2 Exposure Controls

Appropriate Engineering Controls

A laboratory fumehood or other appropriate form of local exhaust ventilation should be used to avoid exposure.

Personal Protective Equipment

All recommendations below are advisory in nature and a risk assessment should be performed by the employer/end user prior to use of this product. The type of protective equipment must be selected based on the amount and concentration of the dangerous material being used in the workplace.

Eye/Face Protection

Safety goggles or face shield. All equipment should have been tested and approved under appropriate standards, such as NIOSH (US), CSA (Canada), or EN 166 (EU).

Skin Protection

Gloves should be used when handling this material. Gloves are to be inspected prior to use. Contaminated gloves are to be removed using proper glove removal technique so that the outer surface of the glove does not contact bare skin. Dispose of contaminated gloves after use in compliance with good laboratory practices and local requirements.

Gloves used for incidental exposures (splash protection) should be designated as “chemical resistant” by EU standard EN 374 with the resistance codes corresponding to the anticipated use of the material. Unrated gloves are not recommended.
Suggested gloves: AnsellPro Sol-Vex nitrile gloves style 37-175, 15 mil thickness.
Penetration time has not been determined.

Gloves used for prolonged direct exposure (immersion) should be designated “chemical resistant” as per EN 734 with the resistance codes corresponding to the anticipated use of the material.
Suggested gloves: AnsellPro Viton/Butyl gloves style 38-612, 4/8 mil thickness.
Penetration time has not been determined.

These recommendations may not apply if the material is mixed with any other chemical, or dissolved into a solution. A risk assessment must be performed to ensure the gloves will still offer acceptable protection.

Body Protection

Fire resistant (Nomex) lab coat or coveralls.

Respiratory Protection

Recommended respirators are NIOSH-approved N100 or CEN-approved FFP3 particulate respirators. These are to be only used as a backup to local exhaust ventilation or other engineering controls. If the respirator is the only means of protection, a full-face supplied air respirator must be used.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on Basic Physical and Chemical Properties

A) Appearance
Dark Brown to Very Dark Brown Solid

B) Odour
No data available

C) Odour Threshold
No data available

D) pH
No data available

E) Melting Point/Freezing Point
No data available

F) Initial Boiling Point/Boiling Range
No data available

G) Flash point
No data available

H) Evaporation Rate
No data available

I) Flammability (Solid/Gas)
No data available

J) Upper/Lower Flammability/Explosive Limits
No data available

K) Vapour Pressure
No data available

L) Vapour Density
No data available

M) Relative Density
No data available

N) Solubility
Acetone (Slightly), DMSO (Slightly), Methanol (Slightly)

O) Partition Coefficient: n-octanol/water
No data available

P) Auto-Ignition Temperature
No data available

Q) Decomposition Temperature
No data available

R) Viscosity
No data available

S) Explosive Properties
No data available

T) Oxidizing Properties
No data available

9.2 Other Information
no data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available.

10.2 Chemical Stability
Stable under recommended storage conditions.

10.3 Possibility of Hazardous Reactions
No data available.

10.4 Conditions to Avoid
No data available.

10.5 Incompatible Materials
Strong oxidizing agents.

10.6 Hazardous Decomposition Products
In the event of fire: See section 5. **Other decomposition products:** No data available.

11. TOXICOLOGICAL INFORMATION

11.1 Information on Toxicological Effects

A) Acute Toxicity
Oral LD50: No data available.
Dermal LD50: No data available.
Inhalation LC50: No data available.

B) Skin Corrosion/Irritation
Moderate skin irritant.

C) Serious Eye Damage/Irritation
Moderate eye irritant.

D) Respiratory or Skin Sensitization
No data available

E) Germ Cell Mutagenicity
No data available

F) Carcinogenicity
No data available

G) Reproductive Toxicity/Teratogenicity
No data available

H) Single Target Organ Toxicity - Single Exposure
Moderate respiratory tract irritation.

I) Single Target Organ Toxicity - Repeated Exposure
No data available

J) Aspiration Hazard
No data available

K) Potential Health Effects and Routes of Exposure

Inhalation
May be harmful if inhaled. Causes respiratory tract irritation.

Ingestion
May be harmful if swallowed.

Skin
May be harmful if absorbed through skin. Causes skin irritation.

Eyes
Causes eye irritation.

L) Signs and Symptoms of Exposure
The most important known symptoms and effects are described in the labeling (see section 2.2) and/or section 11.

To the best of our knowledge, the chemical, physical, and toxicological properties of this material have not been thoroughly investigated.

M) Additional Information

RTECS: Not available.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

No data available.

12.2 Persistance and Degradability

No data available.

12.3 Bioaccumulative Potential

No data available.

12.4 Mobility in Soil

No data available.

12.5 Results of PBT and vPvB Assessment

No data available.

12.6 Other Adverse Effects

No data available.

13. DISPOSAL CONSIDERATIONS

13.1 Waste Treatment Methods

A) Product

Product may be burned in an incinerator equipped with afterburner and scrubber. Excess and expired materials are to be offered to a licensed hazardous material disposal company. Ensure that all Federal and Local regulations regarding the disposal and destruction of this material are followed.

B) Contaminated Packaging

Dispose of as above.

C) Other Considerations

Product is not to be disposed of in sanitary sewers, storm sewers, or landfills.

14. TRANSPORT INFORMATION

14.1 UN Number

DOT (US): N/A IATA: N/A IMDG: N/A ADR/RID: N/A

14.2 UN Proper Shipping Name

DOT (US)/IATA:

Not dangerous goods

IMDG/ARD/RID:

Not dangerous goods

14.3 Transport Hazard Class(es)

DOT (US): N/A IATA: N/A IMDG: N/A ADR/RID: N/A

14.4 Packing Group

DOT (US): N/A IATA: N/A IMDG: N/A ADR/RID: N/A

14.5 Environmental Hazards

DOT (US): None IATA: None IMDG: None ADR/RID: None

14.6 Special Precautions for User

None

15. REGULATORY INFORMATION

This safety data sheet complies with the requirements of WHMIS (Canada), OSHA 1910.1200 (US), and EU Regulation EC No. 1907/2006 (European Union).

15.1 Safety, Health and Environmental Regulations/Legislation Specific for the Substance or Mixture

A) Canada

DSL/NDSL Status: This product is not listed on the Canadian DSL/NDSL.

B) United States

TSCA Status: This product is not listed on the US EPA TSCA.

C) European Union

ECHA Status: This product is not registered with the EU ECHA.

15.2 Chemical Safety Assessment

No data available

16. OTHER INFORMATION

16.1 Revision History

Original Publication Date: 8/24/2016

16.2 List of Abbreviations

LD50	Median lethal dose of a substance required to kill 50% of a test population.
LC50	Medial lethal concentration of a substance required to kill 50% of a test population.
LDLo	Lowest known lethal dose

This Safety Data Sheet contains 16 sections. All 16 sections must be present for this document to be valid.

TDLo	Lowest known toxic dose
IARC	International Agency for Research on Cancer
NTP	National Toxicology Program
RTECS	Registry of Toxic Effects of Chemical Substances

16.3 Further Information

 The above information is believed to be correct to the best of our knowledge, but is to be only used as a guide. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. Please take all due care when handling this product.

TCI AMERICA
SAFETY DATA SHEET

Revision number: 1
Revision date: 07/06/2018

1. IDENTIFICATION

Product name: Tridecafluoroheptanoic Acid
Product code: T1545

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborgate Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Eye Damage/Irritation [Category 1]
WHMIS 2015: Corrosive to Metals [Category 1]
Skin Corrosion/Irritation [Category 1C]

Signal word: Danger!

Hazard Statement(s): May be corrosive to metals
Causes severe skin burns and eye damage

Pictogram(s) or Symbol(s):

Precautionary Statement(s):

[Prevention] Keep only in original container. Do not breathe dusts or mists. Wash hands and face thoroughly after handling. Wear protective gloves, protective clothing, face protection.

[Response] If swallowed: Rinse mouth. Do NOT induce vomiting. Immediately call a poison center or doctor. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Immediately call a poison center or doctor. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor. Absorb spillage to prevent material damage.

[Storage] Store in corrosive resistant bottle or metal container with a resistant inner liner. Store locked up.

[Disposal] Dispose of contents and container in accordance with local, regional, national regulations (e.g. US: 40 CFR Part 261, EU:91/156/EEC, JP: Waste Disposal and Cleaning Act, etc.).

Hazards not otherwise classified: [HNOC] None.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/mixture: Substance
Components: Tridecafluoroheptanoic Acid
Percent: >98.0%(T)
CAS RN: 375-85-9
Molecular Weight: 364.06
Chemical Formula: $C_7HF_{13}O_2$
Synonyms: Perfluoroenanthic Acid , Perfluoroheptanoic Acid , Tridecafluoroenanthic Acid

4. FIRST-AID MEASURES

Description of first aid measures

Inhalation: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/physician.

Skin contact: Remove/Take off immediately all contaminated clothing. Gently wash with plenty of soap and water. Immediately call a POISON CENTER or doctor/physician.

Eye contact: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.Immediately call a POISON CENTER or doctor/physician.

Ingestion: Immediately call a POISON CENTER or doctor/physician. Rinse mouth. Do NOT induce vomiting.

Symptoms/effects:

Acute: Pain. Redness.

Delayed: No data available

Indication of any immediate medical attention:
Not available.
Notes to physician:
No data available

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, foam, water spray, carbon dioxide.

Specific hazards arising from the chemical: Take care as it may decompose upon combustion or in high temperatures to generate poisonous fume.
Hazardous combustion products: These products include: Carbon oxides Halogenated compounds
Other specific hazards: WARNING: Highly toxic HF gas is produced during combustion.

Advice for firefighters: Wear self-contained breathing apparatus if possible.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: Use personal protective equipment. Keep people away from and upwind of spill/leak. Entry to non-involved personnel should be controlled around the leakage area by roping off, etc.
Environmental precautions: Prevent product from entering drains.
Methods and materials for containment and cleaning up: Sweep dust to collect it into an airtight container, taking care not to disperse it. Adhered or collected material should be promptly disposed of, in accordance with appropriate laws and regulations.

7. HANDLING AND STORAGE

Precautions for safe handling: Handling is performed in a well ventilated place. Wear suitable protective equipment. Prevent dispersion of dust. Wash hands and face thoroughly after handling.
Use a closed system if possible. Use a local exhaust if dust or aerosol will be generated.
Avoid contact with skin, eyes and clothing.
Use corrosive resistant equipment.

Conditions for safe storage, including any incompatibilities

Storage conditions: Keep container tightly closed. Store in a cool and dark place.
Store locked up.
Store away from incompatible materials such as oxidizing agents.

Packaging material: Comply with laws. Keep only in original container.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Appropriate engineering controls: Follow safe industrial engineering/laboratory practices when handling any chemical. Install a closed system or local exhaust. Also install safety shower and eye bath.

Personal protective equipment

- **Respiratory protection:** Dust respirator, self-contained breathing apparatus(SCBA), supplied air respirator, etc. Use respirators approved under appropriate government standards and follow local and national regulations.
- **Hand protection:** Impervious gloves.
- **Eye protection:** Safety goggles. A face-shield, if the situation requires.
- **Skin and body protection:** Impervious protective clothing. Protective boots, if the situation requires.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Solid
Form: Crystal - Lump
Colour: White - Very pale yellow
Odour: No data available
Odor threshold: No data available
Odour threshold: No data available

Melting point/freezing point:	32°C (Freezing point) (90°F)	pH:	No data available
Boiling point/range:	177°C (351°F)	**Vapour pressure:**	No data available.
Decomposition temperature:	No data available	**Vapour density:**	No data available
Relative density:	No data available	**Dynamic Viscosity:**	No data available
Kinematic viscosity:	No data available		
Log Pow:	No data available	**Evaporation rate(Butyl Acetate=1):**	No data available
Flash point:	No data available	**Autoignition temperature:**	No data available
Flammability(solid, gas):	No data available	**Flammability or explosive limits:**	
		Lower:	No data available
		Upper:	No data available

Solubility(ies):

- **[Water]** No data available
- **[Other solvents]** No data available

10. STABILITY AND REACTIVITY

Reactivity: No data available
Chemical stability: Stable under proper conditions.
Possibility of hazardous reactions: No special reactivity has been reported.
Incompatible materials: Oxidizing agents
Hazardous decomposition products: Carbon dioxide, Carbon monoxide, Hydrogen fluoride

11. TOXICOLOGICAL INFORMATION

Acute Toxicity:
No data available

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
No data available

Carcinogenicity:
No data available

IARC: No data available **NTP:** No data available **OSHA:** No data available

Reproductive toxicity:
No data available

Target organ(s): No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity:

Fish:	No data available
Crustacea:	No data available
Algae:	No data available

Persistence / degradability:	No data available
Bioaccumulative potential(BCF):	No data available
Mobility in soil	
Log Pow:	No data available
Soil adsorption (Koc):	No data available
Henry's Law (PaM ^{3}/mol):	No data available

13. DISPOSAL CONSIDERATIONS

Disposal of product:	Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.
Disposal of container:	Dispose of as unused product. Do not re-use empty containers.
Other considerations:	Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3261	Corrosive solid, acidic, organic, n.o.s	8 Corrosive material	III

IATA

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3261	Corrosive solid, acidic, organic, n.o.s	8 Corrosive material	III

IMDG

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3261	Corrosive solid, acidic, organic, n.o.s	8 Corrosive material	III

EmS number: F-A, S-B

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):
This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313:	Not Listed
SARA 302:	Not Listed

State Regulations

State Right-to-Know

Massachusetts	Not Listed
New Jersey	Not Listed
Pennsylvania	Not Listed
California Proposition 65:	Not Listed

Other Information

NFPA Rating:		HMIS Classification:	
Health:	3	**Health:**	3
Flammability:	1	**Flammability:**	1
Instability:	0	**Physical:**	0

International Inventories

Canada: NDSL	On NDSL
EC-No:	206-798-9

16. OTHER INFORMATION

Revision date: 07/06/2018
Revision number: 1

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid

Safety Data Sheet 616432S

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 09/04/2016 Version: 1.0

SECTION 1: Identification

1.1. Identification

Product form	:	Substance
Substance name	:	1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid
CAS No	:	375-92-8
Product code	:	6164-3-2S
Formula	:	C7HF15O3S
Synonyms	:	Perfluoroheptanesulfonic acid
Other means of identification	:	MFCD28015666

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	:	Laboratory chemicals Manufacture of substances Scientific research and development

1.3. Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.
P.O. Box 309
Alachua, FL 32615 - United States of America
T (386) 462-0788 - F (386) 462-7097
info@synquestlabs.com - www.synquestlabs.com

1.4. Emergency telephone number

Emergency number	:	(844) 523-4086 (3E Company - Account 10069)

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Acute Tox. 4 (Oral)	H302 -	Harmful if swallowed
Skin Corr. 1B	H314 -	Causes severe skin burns and eye damage
Eye Dam. 1	H318 -	Causes serious eye damage
STOT SE 3	H335 -	May cause respiratory irritation

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :

GHS05 GHS07

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) :
H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H335 - May cause respiratory irritation

Precautionary statements (GHS-US) :
P260 - Do not breathe dust, mist, spray
P264 - Wash skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301+P312 - If swallowed: Call a POISON CENTER or doctor/ physician if you feel unwell
P301+P330+P331 - If swallowed: rinse mouth. Do NOT induce vomiting
P303+P361+P353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/ physician

P321 - Specific treatment (see supplemental first aid instructions on this label)
P330 - Rinse mouth
P363 - Wash contaminated clothing before reuse
P403+P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P501 - Dispose of contents/container to an approved waste disposal plant

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	Classification (GHS-US)
1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid (Main constituent)	(CAS No) 375-92-8	<= 100	Acute Tox. 4 (Oral), H302 Skin Corr. 1B, H314 Eye Dam. 1, H318 STOT SE 3, H335

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Move the affected personnel away from the contaminated area.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Get immediate medical advice/attention.

First-aid measures after skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Get immediate medical advice/attention.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention.

First-aid measures after ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth out with water. Get immediate medical advice/attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11.

Symptoms/injuries after inhalation : Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Alcohol resistant foam. Carbon dioxide. Dry powder. Water spray. Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Thermal decomposition generates: Carbon oxides. Hydrogen fluoride. Sulfur oxides.

5.3. Advice for firefighters

Firefighting instructions : In case of fire: Evacuate area.

Protection during firefighting : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. For further information refer to section 8: "Exposure controls/personal protection".

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe dust.

6.1.1. For non-emergency personnel

Emergency procedures : Only qualified personnel equipped with suitable protective equipment may intervene.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment : Stop leak if safe to do so.

Methods for cleaning up : Sweep or shovel spills into appropriate container for disposal. Minimize generation of dust.

Other information : For disposal of solid materials or residues refer to section 13 : "Disposal considerations".

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Do not handle until all safety precautions have been read and understood. Ensure good ventilation of the work station. Do not breathe dust, mist, spray. Wear personal protective equipment. Avoid contact with skin and eyes.

Hygiene measures : Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Comply with applicable regulations.

Storage conditions : Keep container closed when not in use.

Incompatible materials : Refer to Section 10 on Incompatible Materials.

Storage area : Store in dry, cool, well-ventilated area.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Exposure controls

Appropriate engineering controls : Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Hand protection : Protective gloves. 29 CFR 1910.138: Hand Protection.

Eye protection : Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.

Skin and body protection : Wear suitable protective clothing.

Respiratory protection : In case of inadequate ventilation wear respiratory protection. 29 CFR 1910.134: Respiratory Protection.

Other information : Safety shoes. 29 CFR 1910.136: Foot Protection.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Solid
Color	:	No data available
Odor	:	No data available
Odor threshold	:	No data available
pH	:	No data available
Melting point	:	No data available
Freezing point	:	No data available
Boiling point	:	No data available
Flash point	:	No data available
Relative evaporation rate (butyl acetate=1)	:	No data available
Flammability (solid, gas)	:	No data available

Explosion limits	:	No data available
Explosive properties	:	No data available
Oxidizing properties	:	No data available
Vapor pressure	:	No data available
Relative density	:	No data available
Relative vapor density at 20 °C	:	No data available
Molecular mass	:	450.12 g/mol
Solubility	:	No data available
Log Pow	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

The product is stable at normal handling and storage conditions.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

Keep away from heat, sparks and flame.

10.5. Incompatible materials

Strong bases. Strong oxidizing agents. Strong reducing agents.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	:	Oral: Harmful if swallowed.
Skin corrosion/irritation	:	Causes severe skin burns and eye damage.
Serious eye damage/irritation	:	Causes serious eye damage.
Respiratory or skin sensitization	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified
Specific target organ toxicity (single exposure)	:	May cause respiratory irritation.
Specific target organ toxicity (repeated exposure)	:	Not classified
Aspiration hazard	:	Not classified
Symptoms/injuries after inhalation	:	Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.

SECTION 12: Ecological information

12.1. Toxicity

No additional information available

12.2. Persistence and degradability
No additional information available

12.3. Bioaccumulative potential
No additional information available

12.4. Mobility in soil
No additional information available

12.5. Other adverse effects
No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber.

Waste disposal recommendations : Dispose of contents/container in accordance with licensed collector's sorting instructions.

Additional information : Recycle the material as far as possible.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN3261 Corrosive solid, acidic, organic, n.o.s., 8, II

UN-No.(DOT) : UN3261

Proper Shipping Name (DOT) : Corrosive solid, acidic, organic, n.o.s.

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Hazard labels (DOT) : 8 - Corrosive

Packing group (DOT) : II - Medium Danger

DOT Packaging Non Bulk (49 CFR 173.xxx) : 212

DOT Packaging Bulk (49 CFR 173.xxx) : 240

DOT Symbols : G - Identifies PSN requiring a technical name

DOT Special Provisions (49 CFR 172.102) : IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2).
IP2 - When IBCs other than metal or rigid plastics IBCs are used, they must be offered for transportation in a closed freight container or a closed transport vehicle.
IP4 - Flexible, fiberboard or wooden IBCs must be sift-proof and water-resistant or be fitted with a sift-proof and water-resistant liner.
T3 - 2.65 178.274(d)(2) Normal..... 178.275(d)(2)
TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.

DOT Packaging Exceptions (49 CFR 173.xxx) : 154

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 15 kg

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 50 kg

DOT Vessel Stowage Location	:	B - (i) The material may be stowed ''on deck'' or ''under deck'' on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length; and (ii) ''On deck only'' on passenger vessels in which the number of passengers specified in paragraph (k)(2)(i) of this section is exceeded.
Other information	:	No supplementary information available.

TDG

No additional information available

Transport by sea

UN-No. (IMDG)	:	3261
Proper Shipping Name (IMDG)	:	CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S.
Class (IMDG)	:	8 - Corrosive substances
Packing group (IMDG)	:	II - substances presenting medium danger

Air transport

UN-No. (IATA)	:	3261
Proper Shipping Name (IATA)	:	Corrosive solid, acidic, organic, n.o.s.
Class (IATA)	:	8 - Corrosives
Packing group (IATA)	:	II - Medium Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid (375-92-8)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
EPA TSCA Regulatory Flag	S - S - indicates a substance that is identified in a proposed or final Significant New Uses Rule.

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

CANADA

1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid (375-92-8)
Listed on the Canadian NDSL (Non-Domestic Substances List)

EU-Regulations

No additional information available

National regulations

1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-Pentadecafluoroheptane-1-sulfonic acid (375-92-8)
Listed on the Japanese ISHL (Industrial Safety and Health Law)

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

SECTION 16: Other information

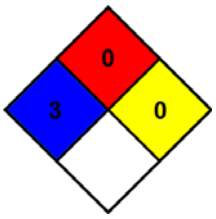
Full text of H-phrases:

Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Skin Corr. 1B	Skin corrosion/irritation Category 1B
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage
H335	May cause respiratory irritation

NFPA health hazard : 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health : 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given

Flammability : 0 Minimal Hazard - Materials that will not burn

Physical : 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable or any damage resulting from handling or from contact with the above product.

TCI AMERICA
SAFETY DATA SHEET

Revision number: 1
Revision date: 07/06/2018

1. IDENTIFICATION

Product name: Undecafluorohexanoic Acid High Grade [Ion-Pair Reagent for LC-MS]
Product code: A5722

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborgate Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Eye Damage/Irritation [Category 1]
WHMIS 2015: Corrosive to Metals [Category 1]
Skin Corrosion/Irritation [Category 1B]

Signal word: Danger!

Hazard Statement(s): May be corrosive to metals
Causes severe skin burns and eye damage

Pictogram(s) or Symbol(s):

Precautionary Statement(s):

[Prevention] Keep only in original container. Do not breathe dusts or mists. Wash hands and face thoroughly after handling. Wear protective gloves, protective clothing, face protection.

[Response] If swallowed: Rinse mouth. Do NOT induce vomiting. Immediately call a poison center or doctor. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Immediately call a poison center or doctor. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor. Absorb spillage to prevent material damage.

[Storage] Store in corrosive resistant bottle or metal container with a resistant inner liner. Store locked up.

[Disposal] Dispose of contents and container in accordance with local, regional, national regulations (e.g. US: 40 CFR Part 261, EU:91/156/EEC, JP: Waste Disposal and Cleaning Act, etc.).

Hazards not otherwise classified: [HNOC] None.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/mixture:	Substance
Components:	Undecafluorohexanoic Acid High Grade [Ion-Pair Reagent for LC-MS]
Percent:	>98.0%(T)
CAS RN:	307-24-4
Molecular Weight:	314.05
Chemical Formula:	$C_6HF_{11}O_2$
Synonyms:	IPC-PFFA-6 HG , Perfluorohexanoic Acid High Grade

4. FIRST-AID MEASURES

Description of first aid measures

Inhalation:	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/physician.
Skin contact:	Remove/Take off immediately all contaminated clothing. Gently wash with plenty of soap and water. Immediately call a POISON CENTER or doctor/physician.
Eye contact:	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.Immediately call a POISON CENTER or doctor/physician.
Ingestion:	Immediately call a POISON CENTER or doctor/physician. Rinse mouth. Do NOT induce vomiting.

Symptoms/effects:

Acute:	Pain. Redness.
Delayed:	No data available

Indication of any immediate medical attention:
Not available.
Notes to physician:
No data available

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media:	Dry chemical, foam, water spray, carbon dioxide.
Specific hazards arising from the chemical:	Take care as it may decompose upon combustion or in high temperatures to generate poisonous fume.
Hazardous combustion products:	These products include: Carbon oxides Halogenated compounds
Other specific hazards:	WARNING: Highly toxic HF gas is produced during combustion.
Advice for firefighters:	Wear self-contained breathing apparatus if possible.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures:	Use personal protective equipment. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Entry to non-involved personnel should be controlled around the leakage area by roping off, etc.
Environmental precautions:	Prevent product from entering drains.
Methods and materials for containment and cleaning up:	Absorb spilled material in a suitable absorbent (e.g. rag, dry sand, earth, saw-dust). In case of large amount of spillage, contain a spill by bunding. Adhered or collected material should be promptly disposed of, in accordance with appropriate laws and regulations.

7. HANDLING AND STORAGE

Precautions for safe handling:	Handling is performed in a well ventilated place. Wear suitable protective equipment. Prevent generation of vapour or mist. Wash hands and face thoroughly after handling. Use a closed system if possible. Use a ventilation, local exhaust if vapour or aerosol will be generated. Avoid contact with skin, eyes and clothing. Use corrosive resistant equipment.

Conditions for safe storage, including any incompatibilities

Storage conditions:	Keep container tightly closed. Store in a cool and dark place. Store under inert gas. Protect from moisture. Store locked up. Store away from incompatible materials such as oxidizing agents. Light-sensitive Hygroscopic
Packaging material:	Comply with laws. Keep only in original container.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Appropriate engineering controls: Follow safe industrial engineering/laboratory practices when handling any chemical. Install a closed system or local exhaust. Also install safety shower and eye bath.

Personal protective equipment

- **Respiratory protection:** Half or full facepiece respirator, self-contained breathing apparatus(SCBA), supplied air respirator, etc. Use respirators approved under appropriate government standards and follow local and national regulations.
- **Hand protection:** Impervious gloves.
- **Eye protection:** Safety goggles. A face-shield, if the situation requires.
- **Skin and body protection:** Impervious protective clothing. Protective boots, if the situation requires.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid
Form: Clear
Colour: Colorless - Almost colorless
Odour: No data available
Odor threshold: No data available
Odour threshold: No data available

Melting point/freezing point:	14°C (57°F)	pH:	No data available
Boiling point/range:	157°C (315°F)	**Vapour pressure:**	No data available.
Decomposition temperature:	No data available	**Vapour density:**	No data available
Relative density:	1.76	**Dynamic Viscosity:**	No data available
Kinematic viscosity:	No data available		
Log Pow:	No data available	**Evaporation rate(Butyl Acetate=1):**	No data available
Flash point:	No data available	**Autoignition temperature:**	No data available
Flammability(solid, gas):	No data available	**Flammability or explosive limits:**	
		Lower:	No data available
		Upper:	No data available

Solubility(ies):

- **[Water]** No data available
- **[Other solvents]** No data available

10. STABILITY AND REACTIVITY

Reactivity: No data available
Chemical stability: Stable under proper conditions.
Possibility of hazardous reactions: No special reactivity has been reported.
Incompatible materials: Oxidizing agents
Hazardous decomposition products: Carbon dioxide, Carbon monoxide, Hydrogen fluoride

11. TOXICOLOGICAL INFORMATION

Acute Toxicity:
No data available

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
No data available

Carcinogenicity:
No data available

IARC: No data available **NTP:** No data available **OSHA:** No data available

Reproductive toxicity:
No data available

Target organ(s): No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity:

Fish:	No data available
Crustacea:	No data available
Algae:	No data available

Persistence / degradability:	No data available
Bioaccumulative potential(BCF):	No data available
Mobility in soil	
Log Pow:	No data available
Soil adsorption (Koc):	No data available
Henry's Law (PaM ^{3}/mol):	No data available

13. DISPOSAL CONSIDERATIONS

Disposal of product:	Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.
Disposal of container:	Dispose of as unused product. Do not re-use empty containers.
Other considerations:	Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3265	Corrosive liquid, acidic, organic, n.o.s	8 Corrosive material	II

IATA

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3265	Corrosive liquid, acidic, organic, n.o.s	8 Corrosive material	II

IMDG

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3265	Corrosive liquid, acidic, organic, n.o.s	8 Corrosive material	II

EmS number: F-A, S-B

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):
This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313: Not Listed
SARA 302: Not Listed

State Regulations

State Right-to-Know

Massachusetts Not Listed
New Jersey Not Listed
Pennsylvania Not Listed
California Proposition 65: Not Listed

Other Information

NFPA Rating:
Health: 3
Flammability: 0
Instability: 0

HMIS Classification:
Health: 3
Flammability: 0
Physical: 0

International Inventories

Canada: NDSL On NDSL
EC-No: 206-196-6

16. OTHER INFORMATION

Revision date: 07/06/2018
Revision number: 1

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

Perfluorohexanesulfonic acid

Safety Data Sheet 616432T

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 09/21/2016 Version: 1.0

SECTION 1: Identification

1.1. Identification

Product form	:	Substance
Substance name	:	Perfluorohexanesulfonic acid
CAS No	:	355-46-4
Product code	:	6164-3-2T
Formula	:	C6HF13O3S
Synonyms	:	1,1,2,2,3,3,4,4,5,5,6,6,6-Tridecafluorohexane-1-sulfonic acid
Other means of identification	:	MFCD00042453

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	:	Laboratory chemicals Manufacture of substances Scientific research and development

1.3. Details of the supplier of the safety data sheet

SynQuest Laboratories, Inc.
P.O. Box 309
Alachua, FL 32615 - United States of America
T (386) 462-0788 - F (386) 462-7097
info@synquestlabs.com - www.synquestlabs.com

1.4. Emergency telephone number

Emergency number	:	(844) 523-4086 (3E Company - Account 10069)

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Acute Tox. 4 (Oral)	H302 -	Harmful if swallowed
Skin Corr. 1B	H314 -	Causes severe skin burns and eye damage
Eye Dam. 1	H318 -	Causes serious eye damage
STOT SE 3	H335 -	May cause respiratory irritation

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :

GHS05 GHS07

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) :
H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H335 - May cause respiratory irritation

Precautionary statements (GHS-US) :
P260 - Do not breathe dust, mist, spray
P264 - Wash skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301+P312 - If swallowed: Call a POISON CENTER or doctor/ physician if you feel unwell
P301+P330+P331 - If swallowed: rinse mouth. Do NOT induce vomiting
P303+P361+P353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/ physician
P321 - Specific treatment (see supplemental first aid instructions on this label)
P330 - Rinse mouth

P363 - Wash contaminated clothing before reuse
P403+P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P501 - Dispose of contents/container to an approved waste disposal plant

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Substance type : Mono-constituent

Name	Product identifier	%	Classification (GHS-US)
Perfluorohexanesulfonic acid (Main constituent)	(CAS No) 355-46-4	<= 100	Acute Tox. 4 (Oral), H302 Skin Corr. 1B, H314 Eye Dam. 1, H318 STOT SE 3, H335

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Move the affected personnel away from the contaminated area.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Get immediate medical advice/attention.

First-aid measures after skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Get immediate medical advice/attention.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention.

First-aid measures after ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth out with water. Get immediate medical advice/attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11.

Symptoms/injuries after inhalation : Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Alcohol resistant foam. Carbon dioxide. Dry powder. Water spray. Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Thermal decomposition generates: Carbon oxides. Hydrogen fluoride. Sulfur oxides.

5.3. Advice for firefighters

Firefighting instructions : In case of fire: Evacuate area.

Protection during firefighting : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. For further information refer to section 8: "Exposure controls/personal protection".

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Evacuate unnecessary personnel. Ensure adequate air ventilation. Do not breathe dust.

6.1.1. For non-emergency personnel

Emergency procedures : Only qualified personnel equipped with suitable protective equipment may intervene.

6.1.2. For emergency responders

Protective equipment	:	Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment	:	Stop leak if safe to do so.
Methods for cleaning up	:	Sweep or shovel spills into appropriate container for disposal. Minimize generation of dust.
Other information	:	For disposal of solid materials or residues refer to section 13 : "Disposal considerations".

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Do not handle until all safety precautions have been read and understood. Ensure good ventilation of the work station. Do not breathe dust, mist, spray. Wear personal protective equipment. Avoid contact with skin and eyes.
Hygiene measures	:	Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures	:	Comply with applicable regulations.
Storage conditions	:	Keep container closed when not in use. Hygroscopic. Keep contents under inert gas.
Incompatible materials	:	Refer to Section 10 on Incompatible Materials.
Storage area	:	Store in dry, cool, well-ventilated area.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Exposure controls

Appropriate engineering controls	:	Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Hand protection	:	Protective gloves. 29 CFR 1910.138: Hand Protection.
Eye protection	:	Chemical goggles or safety glasses. Face shield. 29 CFR 1910.133: Eye and Face Protection.
Skin and body protection	:	Wear suitable protective clothing.
Respiratory protection	:	In case of inadequate ventilation wear respiratory protection. 29 CFR 1910.134: Respiratory Protection.
Other information	:	Safety shoes. 29 CFR 1910.136: Foot Protection.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Solid
Color	:	No data available
Odor	:	No data available
Odor threshold	:	No data available
pH	:	No data available
Melting point	:	No data available
Freezing point	:	No data available
Boiling point	:	No data available
Flash point	:	No data available
Relative evaporation rate (butyl acetate=1)	:	No data available
Flammability (solid, gas)	:	No data available
Explosion limits	:	No data available
Explosive properties	:	No data available

Oxidizing properties	:	No data available
Vapor pressure	:	No data available
Relative density	:	No data available
Relative vapor density at 20 °C	:	No data available
Molecular mass	:	400.11 g/mol
Solubility	:	No data available
Log Pow	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

The product is stable at normal handling and storage conditions.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

Keep away from heat, sparks and flame.

10.5. Incompatible materials

Strong bases. Strong oxidizing agents. Strong reducing agents.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	:	Oral: Harmful if swallowed.
Skin corrosion/irritation	:	Causes severe skin burns and eye damage.
Serious eye damage/irritation	:	Causes serious eye damage.
Respiratory or skin sensitization	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified
Specific target organ toxicity (single exposure)	:	May cause respiratory irritation.
Specific target organ toxicity (repeated exposure)	:	Not classified
Aspiration hazard	:	Not classified
Symptoms/injuries after inhalation	:	Material is destructive to tissue of the mucuous membranes and upper respiratory tract. Cough, shortness of breath, headache, nausea.

SECTION 12: Ecological information

12.1. Toxicity

No additional information available

12.2. Persistence and degradability

No additional information available

12.3. Bioaccumulative potential

No additional information available

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods : Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber.

Waste disposal recommendations : Dispose of contents/container in accordance with licensed collector's sorting instructions.

Additional information : Recycle the material as far as possible.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN3261 Corrosive solid, acidic, organic, n.o.s., 8, II

UN-No.(DOT) : UN3261

Proper Shipping Name (DOT) : Corrosive solid, acidic, organic, n.o.s.

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Hazard labels (DOT) : 8 - Corrosive

Packing group (DOT) : II - Medium Danger

DOT Packaging Non Bulk (49 CFR 173.xxx) : 212

DOT Packaging Bulk (49 CFR 173.xxx) : 240

DOT Symbols : G - Identifies PSN requiring a technical name

DOT Special Provisions (49 CFR 172.102) : IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2).
IP2 - When IBCs other than metal or rigid plastics IBCs are used, they must be offered for transportation in a closed freight container or a closed transport vehicle.
IP4 - Flexible, fiberboard or wooden IBCs must be sift-proof and water-resistant or be fitted with a sift-proof and water-resistant liner.
T3 - 2.65 178.274(d)(2) Normal..... 178.275(d)(2)
TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.

DOT Packaging Exceptions (49 CFR 173.xxx) : 154

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 15 kg

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 50 kg

DOT Vessel Stowage Location	:	B - (i) The material may be stowed ‘‘on deck’’ or ‘‘under deck’’ on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length; and (ii) ‘‘On deck only’’ on passenger vessels in which the number of passengers specified in paragraph (k)(2)(i) of this section is exceeded.
Other information	:	No supplementary information available.

TDG

No additional information available

Transport by sea

UN-No. (IMDG)	:	3261
Proper Shipping Name (IMDG)	:	CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S.
Class (IMDG)	:	8 - Corrosive substances
Packing group (IMDG)	:	II - substances presenting medium danger

Air transport

UN-No. (IATA)	:	3261
Proper Shipping Name (IATA)	:	Corrosive solid, acidic, organic, n.o.s.
Class (IATA)	:	8 - Corrosives
Packing group (IATA)	:	II - Medium Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

Perfluorohexanesulfonic acid (355-46-4)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
EPA TSCA Regulatory Flag	S - S - indicates a substance that is identified in a proposed or final Significant New Uses Rule.

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

CANADA

Perfluorohexanesulfonic acid (355-46-4)
Listed on the Canadian NDSL (Non-Domestic Substances List)

EU-Regulations

No additional information available

National regulations

Perfluorohexanesulfonic acid (355-46-4)
Listed on the Japanese ISHL (Industrial Safety and Health Law)

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

SECTION 16: Other information

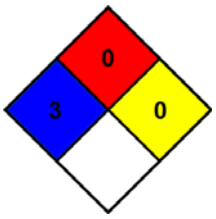
Full text of H-phrases:

Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Skin Corr. 1B	Skin corrosion/irritation Category 1B
STOT SE 3	Specific target organ toxicity (single exposure) Category 3
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage
H335	May cause respiratory irritation

NFPA health hazard : 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health : 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given

Flammability : 0 Minimal Hazard - Materials that will not burn

Physical : 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

SDS US (GHS HazCom 2012)

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is offered solely for your consideration, investigation, and verification. It does not represent any guarantee of the properties of the product nor that the hazard precautions or procedures described are the only ones which exist. SynQuest shall not be held liable or any damage resulting from handling or from contact with the above product.

TCI AMERICA

SAFETY DATA SHEET

Revision number: 2
Revision date: 10/06/2014

1. IDENTIFICATION

Product name: Heptadecafluorononanoic Acid
Product code: H0843

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborgate Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Eye Damage/Irritation [Category 1]
Skin Corrosion/Irritation [Category 1C]

Signal word: Danger!

Hazard Statement(s): Causes serious eye damage
Causes severe skin burns and eye damage

Pictogram(s) or Symbol(s):

Precautionary Statement(s):

[Prevention] Do not breathe dusts or mists. Use only outdoors or in a well-ventilated area. Wear protective gloves, protective clothing, eye protection and face protection. Wear eye protection. Wear face protection (full length face shield).

[Response] If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

[Storage] Store locked up.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance
Components: Heptadecafluorononanoic Acid
Percent: >95.0%(GC)(T)

3. COMPOSITION/INFORMATION ON INGREDIENTS

CAS Number: 375-95-1
Molecular Weight: 464.08
Chemical Formula: $C_9HF_{17}O_2$
Synonyms: Heptadecafluoropelargonic Acid , Perfluorononanoic Acid , Perfluoropelargonic Acid

4. FIRST-AID MEASURES

Inhalation: Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact: For severe burns, immediate medical attention is required. Immediately call a poison center or doctor. Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Eye contact: IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Eye contact with vapors or substance may cause severe injury, burns, or death. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Do not induce vomiting with out medical advice. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: Pain. Redness.
Delayed: No data available

Immediate medical attention: WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is corrosive. For severe burns, immediate medical attention is required. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO_2 or water spray. Consult with local fire authorities before attempting large scale fire fighting operations.

Specific hazards arising from the chemical
Hazardous combustion products: These products include: Carbon oxides Halogenated compounds
Other specific hazards: WARNING: Highly toxic HF gas is produced during combustion.

Special precautions for fire-fighters:
Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.
Special protective equipment for fire-fighters:
Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

Emergency procedures: Prevent dust cloud. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

6. ACCIDENTAL RELEASE MEASURES

Methods and materials for containment and cleaning up:
ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material.
Environmental precautions:
Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid inhalation of vapor or mist. Manipulate under an adequate fume hood. Avoid contact with skin and eyes. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Store locked up. Keep containers tightly closed in a cool, well-ventilated place. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Bases, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

Appropriate engineering controls:
Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection: Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection: Nitrile gloves.
Eye protection: Safety glasses.
Skin and body protection: Wear protective clothing (lab coat and chemical resistant boots).

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Solid
Form: Crystal - Powder
Color: White - Pale yellow
Odor: No data available
Odor threshold: No data available

Melting point/freezing point: 65°C (149°F)
Boiling point/range: No data available
Decomposition temperature: No data available
Relative density: No data available
Kinematic Viscosity: No data available

Partition coefficient: n-octanol/water (log P_{ow}) No data available

Flash point: No data available
Flammability (solid, gas): No data available

pH: No data available
Vapor pressure: No data available
Vapor density: No data available
Dynamic Viscosity: No data available

Evaporation rate: (Butyl Acetate = 1) No data available

Autoignition temperature: No data available
Flammability or explosive limits:
Lower: No data available
Upper: No data available

Solubility(ies):

10. STABILITY AND REACTIVITY

Reactivity: Not Available.
Chemical Stability: Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions: No hazardous reactivity has been reported.
Conditions to avoid: Avoid excessive heat and light.
Incompatible materials: Alkali, Bases, Reducing agents, Strong oxidizing agents
Hazardous Decomposition Products: No data available

11. TOXICOLOGICAL INFORMATION

Acute Toxicity:
No data available

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
No data available

Carcinogenicity:

No data available

IARC: No data available **NTP:** No data available **OSHA:** No data available

Reproductive toxicity:
No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.
Symptoms related to exposure:
Skin contact may produce burrns. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Eye contact can result in corneal damage or blindness.
Potential Health Effects:
No specific information available; skin and eye contact may result in irriatation. May be harmful if inhaled or ingested.
Target organ(s): No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity

Fish:	No data available
Crustacea:	No data available
Algae:	No data available

Persistence and degradability:	No data available
Bioaccumulative potential (BCF):	No data available
Mobillity in soil:	No data available
Partition coefficient: n-octanol/water (log P_{ow})	No data available
Soil adsorption (Koc):	No data available
Henry's Law: constant (PaM^3/mol)	No data available

13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.
Disposal of container: Dispose of as unused product. Do not re-use empty containers.
Other considerations: Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US) Non-hazardous for transportation.

14. TRANSPORT INFORMATION

IATA Non-hazardous for transportation.

IMDG Non-hazardous for transportation.

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):
This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313:	Not Listed
SARA 302:	Not Listed

State Regulations

State Right-to-Know

Massachusetts	Not Listed
New Jersey	Not Listed
Pennsylvania	Not Listed
California Proposition 65:	Not Listed

Other Information

NFPA Rating:

Health:	2
Flammability:	0
Instability:	0

HMIS Classification:

Health:	2
Flammability:	0
Physical:	0

International Inventories

WHMIS hazard class:	E: Corrosive material.
EC-No:	206-801-3

16. OTHER INFORMATION

Revision date: 10/06/2014
Revision number: 2
TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

PERFLUOROOCTANOIC ACID **ICSC: 1613 (April 2017)**

Pentadecafluorooctanoic acid
Pentadecafluoro-n-octanoic acid
Perfluorocaprylic acid
PFOA

CAS #: 335-67-1
UN #: 3261
EC Number: 206-397-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion on contact with bases, oxidants or reducing agents.	NO contact with incompatible substances. See Chemical Dangers.	Use water spray, carbon dioxide, dry powder, foam.

AVOID ALL CONTACT! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat.	Use local exhaust or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness. Pain.	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles or eye protection in combination with breathing protection if powder.	Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer immediately for medical attention.
Ingestion	Abdominal pain. Nausea. Vomiting. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered non-metallic containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Store only in original container. Separated from food and feedstuffs and incompatible materials. See Chemical Dangers.

PACKAGING

Do not transport with food and feedstuffs.
Unbreakable packaging.
Put breakable packaging into closed unbreakable container.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Harmful if swallowed
Toxic if inhaled
Causes serious eye irritation
May cause damage to immune system and liver through prolonged or repeated exposure
May damage fertility or the unborn child
May cause harm to breast-fed children
Suspected of causing cancer

Transportation
UN Classification
UN Hazard Class: 8; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

PERFLUOROOCTANOIC ACID **ICSC: 1613**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
WHITE POWDER WITH PUNGENT ODOUR.

Physical dangers
No data.

Chemical dangers
Decomposes on heating above 300°C . This produces toxic and corrosive gases including hydrogen fluoride (See ICSC 0283). The solution is a weak acid. Reacts with bases, oxidants and reducing agents. This produces flammable/explosive gas (hydrogen - see ICSC 0001). Attacks many metals.

Formula: $C_8HF_{15}O_2$
Molecular mass: 414.1
Boiling point: 189°C
Melting point: 52-54°C
Density: 1.79 g/cm³
Solubility in water: none
Octanol/water partition coefficient as log Pow: 6.3

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

Effects of short-term exposure
The substance is irritating to the eyes, skin and respiratory tract.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
The substance may have effects on the liver and immune system. This substance is possibly carcinogenic to humans. May cause toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

MAK: (inhalable fraction): 0.005 mg/m^3; peak limitation category: II(8); skin absorption (H); carcinogen category: 4; pregnancy risk group: C

ENVIRONMENT

NOTES

ADDITIONAL INFORMATION

EC Classification
Symbol: T, Xn; R: 40-61-48/23-48/21/22-41-64; S: 53-45

TCI AMERICA

Material Safety Data Sheet

HAZARD WARNINGS	RISK PHRASES	PROTECTIVE CLOTHING
	**Corrosive to eyes and skin on contact.** **Toxic compound, do not ingest or inhale. Avoid all contact with this material.** **Environmental hazard.** **This material is toxic to aquatic organisms and may cause long term adverse effects to the aquatic environment.** **POSSIBLE MUTAGEN. MINIMIZE EXPOSURE.**	

Section I. Chemical Product and Company Identification

Chemical Name: **Heptadecafluorooctanesulfonic Acid**

Catalog Number	H0781
Synonym	Perfluorooctanesulfonic Acid
Chemical Formula	$C_8HF_{17}O_3S$
CAS Number	1763-23-1

Supplier: TCI America
9211 N. Harborgate St.
Portland OR
1-800-423-8616

In case of Emergency Call: **Chemtrec®**
(800) 424-9300 (U.S.)
(703) 527-3887 (International)

Section II. Composition and Information on Ingredients

Chemical Name	CAS Number	Percent (%)	TLV/PEL	Toxicology Data
Heptadecafluorooctanesulfonic Acid	1763-23-1	Min. 98.0 (T)	This compound is classified as a possible mutagen. There is no acceptable exposure limit for a mutagen.	Rat LD_{50} (oral) 154 mg/kg

Section III. Hazards Identification

Acute Health Effects

Corrosive to skin, eyes, and respiratory system. Liquid or spray mist may produce tissue damage, particularly in mucous membranes of the eyes, mouth and respiratory tract. Skin contact may produce burns. Eye contact can result in corneal damage or blindness. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Corrosive materials may cause serious injury if ingested.
Toxic if ingested or inhaled. Avoid prolonged contact with this material. Overexposure may result in serious illness or death. Follow safe industrial hygiene practices and always wear proper protective equipment when handling this compound.

Chronic Health Effects

CARCINOGENIC EFFECTS : Not available.
MUTAGENIC EFFECTS : Not available.
TERATOGENIC EFFECTS : Not available.
DEVELOPMENTAL TOXICITY: Reproductive effects.
Rat TDLo Oral 50 mg/kg, female 19-20 days of pregnancy
TOXIC EFFECTS:
Effects on Newborn - Viability index
Effects on Newborn - Other neonatal measures or effects
Effects on Newborn - Growth statistics
Rat TDLo Oral 100 mg/kg, female 19-20 days of pregnancy
TOXIC EFFECTS:
Effects on Newborn - Stillbirth
Rat TDLo Unreported 50 mg/kg, female 19-20 days of pregnancy
TOXIC EFFECTS:
Specific Developmental Abnormalities - Respiratory system
Effects on Newborn - Live birth index
Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section IV. First Aid Measures

Eye Contact

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Inhalation

If the victim is not breathing, perform mouth-to-mouth resuscitation. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, oxygen can be administered. Seek medical attention if respiration problems do not improve.

Ingestion

DO NOT INDUCE VOMITING. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive.

Continued on Next Page **Emergency phone number (800) 424-9300**

Section V. Fire and Explosion Data

Flammability	May be combustible at high temperature.	Auto-Ignition	Not available.
Flash Points	Not available.	Flammable Limits	Not available.
Combustion Products	These products are toxic carbon oxides (CO, CO_2), halogenated compounds, sulfur oxides (SO_x). WARNING: Highly toxic HF gas is produced during combustion.		
Fire Hazards	Not available.		
Explosion Hazards	Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.		
Fire Fighting Media and Instructions	SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. DO NOT use water jet. Consult with local fire authorities before attempting large scale fire-fighting operations.		

Section VI. Accidental Release Measures

Spill Cleanup Instructions	Corrosive material. Toxic material. Environmentally hazardous material. Possibly mutagenic material. Stop leak if without risk. DO NOT get water inside container. DO NOT touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all sources of ignition. Consult federal, state, and/or local authorities for assistance on disposal.

Section VII. Handling and Storage

Handling and Storage Information	CORROSIVE. TOXIC. ENVIRONMENTAL HAZARD. POSSIBLE MUTAGEN. Keep locked up. Keep container dry. Keep away from heat. Mechanical exhaust required. When not in use, tightly seal the container and store in a dry, cool place. Avoid excessive heat and light. DO NOT ingest. Do not breathe dust. Never add water to this product. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Treat symptomatically and supportively. Always store away from incompatible compounds such as oxidizing agents, alkalis (bases).

Section VIII. Exposure Controls/Personal Protection

Engineering Controls	Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.
Personal Protection	Face shield. Lab coat. Dust respirator. Boots. Gloves. A MSHA/NIOSH approved respirator must be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product. 
Exposure Limits	This compound is classified as a possible mutagen. There is no acceptable exposure limit for a mutagen.

Section IX. Physical and Chemical Properties

Physical state @ 20°C	Solid. (White crystal ~ powder.)	Solubility	Soluble in water.
Specific Gravity	Not available.		
Molecular Weight	500.13	Partition Coefficient	Not available.
Boiling Point	260°C (500°F)	Vapor Pressure	0.3 Pa (@ 25°C)
Melting Point	90°C (194°F)	Vapor Density	Not available.
Refractive Index	Not available.	Volatility	Not available.
Critical Temperature	Not available.	Odor	Not available.
Viscosity	Not available.	Taste	Not available.

Section X. Stability and Reactivity Data

Stability	This material is stable if stored under proper conditions. (See Section VII for instructions)
Conditions of Instability	Avoid excessive heat and light.
Incompatibilities	Reactive with oxidizing agents, alkalis (bases).

Continued on Next Page

Printed 1/6/2010.

Section XI. Toxicological Information

RTECS Number	RG9701600
Routes of Exposure	Eye Contact. Ingestion. Inhalation. Skin contact.
Toxicity Data	Rat LD_{50} (oral) 154 mg/kg
Chronic Toxic Effects	**CARCINOGENIC EFFECTS** : Not available. **MUTAGENIC EFFECTS** : Not available. **TERATOGENIC EFFECTS** : Not available. **DEVELOPMENTAL TOXICITY**: Reproductive effects. Rat TDLo Oral 50 mg/kg, female 19-20 days of pregnancy TOXIC EFFECTS: Effects on Newborn - Viability index Effects on Newborn - Other neonatal measures or effects Effects on Newborn - Growth statistics Rat TDLo Oral 100 mg/kg, female 19-20 days of pregnancy TOXIC EFFECTS: Effects on Newborn - Stillbirth Rat TDLo Unreported 50 mg/kg, female 19-20 days of pregnancy TOXIC EFFECTS: Specific Developmental Abnormalities - Respiratory system Effects on Newborn - Live birth index Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.
Acute Toxic Effects	Corrosive to skin, eyes, and respiratory system. Liquid or spray mist may produce tissue damage, particularly in mucous membranes of the eyes, mouth and respiratory tract. Skin contact may produce burns. Eye contact can result in corneal damage or blindness. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Corrosive materials may cause serious injury if ingested. Toxic if ingested or inhaled. Avoid prolonged contact with this material. Overexposure may result in serious illness or death. Follow safe industrial hygiene practices and always wear proper protective equipment when handling this compound.

Section XII. Ecological Information

Ecotoxicity	Not available.
Environmental Fate	Perfluorooctane sulfonic acid's production and use as a precursor for fluorinated surfactants has resulted in its release to the environment through various waste streams. If released to air, an estimated vapor pressure of 2.0X10-3 mm Hg at 25 deg C indicates perfluorooctane sulfonic acid will exist solely as a vapor in the ambient atmosphere. Vapor-phase perfluorooctane sulfonic acid will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 110 days. If released to soil, perfluorooctane sulfonic acid is expected to have no mobility based upon an estimated Koc of 100,000. Perfluorooctane sulfonic acid is essentially nonvolatile. Perfluoro compound recalcitrance can be attributed to the stability conferred by fluorine substitutes and the absence of structures susceptible to electrophilic or nucleophilic attack. Perfluorooctane sulfonic acid reached 0% of its theoretical BOD in four weeks using an activated sludge inoculum in the manometric respirometry test. If released into water, perfluorooctane sulfonic acid is expected to adsorb to suspended solids and sediment based upon the estimated Koc. Volatilization from water surfaces is not expected to be an important fate process as the compound is essentially nonvolatile; an estimated volatilization half-life for a model pond is 3 years if adsorption is considered. An estimated BCF of 56 suggests the potential for bioconcentration in aquatic organisms is moderate. Monitoring studies however would suggest that this compound is highly bioaccumulative. As a class, fluorinated organic compounds are resistant to hydrolysis. Occupational exposure to perfluorooctane sulfonic acid may occur through inhalation and dermal contact with this compound at workplaces where perfluorooctane sulfonic acid is produced or used. Monitoring data indicate that the general population may be exposed to perfluorooctane sulfonic acid via ingestion of contaminated fish and drinking water, and dermal contact with this compound and other products containing perfluorooctane sulfonic acid.

Section XIII. Disposal Considerations

Waste Disposal	Recycle to process, if possible. Consult your local regional authorities. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. Observe all federal, state and local regulations when disposing of the substance.

Section XIV. Transport Information

DOT Classification	DOT CLASS 8: Corrosive material DOT CLASS 6.1: Toxic material
PIN Number	UN2923
Proper Shipping Name	Corrosive solid, toxic, n.o.s.
Packing Group (PG)	II
DOT Pictograms	

Continued on Next Page Emergency phone number (800) 424-9300

Section XV. Other Regulatory Information and Pictograms

TSCA Chemical Inventory (EPA)	This compound is **ON** the EPA Toxic Substances Control Act (TSCA) inventory list.
WHMIS Classification (Canada)	CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS E: Corrosive solid. On NDSL.
EINECS Number (EEC)	217-179-8
EEC Risk Statements	R23/24/25- Toxic by inhalation, in contact with skin and if swallowed. R34- Causes burns. R46- May cause heritable genetic damage. R47- May cause birth defects. R51- Toxic to aquatic organisms. R53- May cause long-term adverse effects in the aquatic environment.
Japanese Regulatory Data	ENCS No. 2-1595

Section XVI. Other Information

Version 1.0
Validated on 1/6/2010.
Printed 1/6/2010.

Notice to Reader

TCI AMERICA

SAFETY DATA SHEET

Revision number: 1
Revision date: 11/12/2013

1. IDENTIFICATION

Product name: Nonafluorovaleric Acid (ca. 0.5mol/L in Water) [Ion-Pair Reagent for LC-MS]
Product code: A5714

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborgate Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales@tciamerica.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:
Eye Damage/Irritation [Category 1]
Corrosive to Metals [Category 1]
Skin Corrosion/Irritation [Category 1B]

Signal word: Danger!

Hazard Statement(s):
Causes serious eye damage
Causes severe skin burns and eye damage
May be corrosive to metals

Pictogram(s) or Symbol(s):

Precautionary Statement(s):

[Prevention] Do not breathe dusts or mists. Use only outdoors or in a well-ventilated area. Wear protective gloves, protective clothing, eye protection and face protection. Wear eye protection. Wear face protection (full length face shield). Keep only in original container.

[Response] If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center or doctor. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Absorb spillage to prevent material damage.

[Storage] Store locked up. Store in corrosive resistant container with a resistant inner liner.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Mixture

3. COMPOSITION/INFORMATION ON INGREDIENTS

Components: Nonafluorovaleric Acid (ca. 0.5mol/L in Water) [Ion-Pair Reagent for LC-MS]
Percent: ....
CAS Number: 2706-90-3
Molecular Weight: 264.05
Chemical Formula: $C_5HF_9O_2$
Synonyms: IPC-PFFA-5 , Nonafluoropentanoic Acid , Perfluoropentanoic Acid , Perfluorovaleric Acid

4. FIRST-AID MEASURES

Inhalation: Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact: For severe burns, immediate medical attention is required. Immediately call a poison center or doctor. Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Eye contact: IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Eye contact with vapors or substance may cause severe injury, burns, or death. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Do not induce vomiting with out medical advice. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: Pain. Redness.
Delayed: No data available

Immediate medical attention: WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is corrosive. For severe burns, immediate medical attention is required. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO_2 or water spray. Consult with local fire authorities before attempting large scale fire fighting operations.

Specific hazards arising from the chemical
Hazardous combustion products: These products include: Carbon oxides Halogenated compounds
Other specific hazards: WARNING: Highly toxic HF gas is produced during combustion.

Special precautions for fire-fighters:
Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.
Special protective equipment for fire-fighters:
Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures: In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:
ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Ventilate the area.
Environmental precautions:
Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Do NOT breath gas, fumes, vapor, or spray. Manipulate under an adequate fume hood. Avoid contact with skin and eyes. May corrode metallic surfaces. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Store in corrosive resistant container with a resistant inner liner. Keep containers tightly closed in a cool, well-ventilated place. Store locked up. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Bases, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

Appropriate engineering controls:
Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection: Vapor respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection: Nitrile gloves.
Eye protection: Wear eye protection (splash goggles) and face protection (full length face shield).
Skin and body protection: Wear protective clothing (lab coat and chemical resistant boots).

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Liquid
Form: Clear
Color: Colorless - Almost colorless
Odor: No data available
Odor threshold: No data available

Melting point/freezing point:	No data available	**pH:**	No data available
Boiling point/range:	No data available	**Vapor pressure:**	No data available
Decomposition temperature:	No data available	**Vapor density:**	No data available
Relative density:	No data available	**Dynamic Viscosity:**	No data available
Kinematic viscosity:	No data available		
Partition coefficient: n-octanol/water (log P_{ow})	No data available	**Evaporation rate:** (Butyl Acetate = 1)	No data available
Flash point:	No data available	**Autoignition temperature:**	No data available
Flammability (solid, gas):	No data available	**Flammability or explosive limits:**	
		Lower:	No data available
		Upper:	No data available

Solubility(ies):

10. STABILITY AND REACTIVITY

Reactivity: Corrodes in contact with metals.
Chemical Stability: Stable under recommended storage conditions. (See Section 7)

10. STABILITY AND REACTIVITY

Possibility of Hazardous Reactions: No hazardous reactivity has been reported.
Conditions to avoid: Avoid excessive heat and light.
Incompatible materials: Oxidizing agents
Hazardous Decomposition Products: No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: No data available

Acute Toxicity:
No data available

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
No data available

Carcinogenicity:

No data available

IARC: No data available **NTP:** No data available **OSHA:** No data available

Reproductive toxicity:
No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.
Symptoms related to exposure:
Skin contact may produce burrns. Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Eye contact can result in corneal damage or blindness.
Potential Health Effects:
No specific information available; skin and eye contact may result in irriatation. May be harmful if inhaled or ingested.
Target organ(s): No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity
Fish: No data available
Crustacea: No data available
Algae: No data available

Persistence and degradability: No data available
Bioaccumulative potential (BCF): No data available
Mobillity in soil: No data available
Partition coefficient: n-octanol/water (log P_{ow}) No data available
Soil adsorption (Koc): No data available
Henry's Law: constant (PaM^3/mol) No data available

13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.
Disposal of container: Dispose of as unused product. Do not re-use empty containers.

13. DISPOSAL CONSIDERATIONS

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3265	Corrosive liquid, acidic, organic, n.o.s.	8 Corrosive material	II

IATA

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3265	Corrosive liquid, acidic, organic, n.o.s.	8 Corrosive material	II

IMDG

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3265	Corrosive liquid, acidic, organic, n.o.s.	8 Corrosive material	II

EmS number: F-A, S-B

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):
This product is ON the EPA Toxic Substances Control Act (TSCA) inventory.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313: Not Listed
SARA 302: Not Listed

State Regulations

State Right-to-Know

Massachusetts Not Listed
New Jersey Not Listed
Pennsylvania Not Listed
California Proposition 65: Not Listed

Other Information

NFPA Rating:

Health: 3
Flammability: 0
Instability: 0

HMIS Classification:

Health: 3
Flammability: 0
Physical: 0

International Inventories

WHMIS hazard class: E: Corrosive material.
EC-No: 220-300-7
Notice Through Official Gazettes Reference Number: (Japan)
ENCS: (2)-1182

16. OTHER INFORMATION

Revision date: 11/12/2013
Revision number: 1

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

1 Identification

Product identifier

Product name: Perfluorotetradecanoic acid

Stock number: L13796
CAS Number:
376-06-7
EC number:
206-803-4
Relevant identified uses of the substance or mixture and uses advised against.
Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet
Manufacturer/Supplier:
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com
Information Department: Health, Safety and Environmental Department
Emergency telephone number:
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)


GHS05 Corrosion

Skin Corr. 1B H314 Causes severe skin burns and eye damage.
Eye Dam. 1 H318 Causes serious eye damage.
Hazards not otherwise classified No information known.

Label elements
GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
Hazard pictograms


GHS05

Signal word Danger
Hazard statements
H314 Causes severe skin burns and eye damage.
Precautionary statements
P260 Do not breathe dust/fume/gas/mist/vapours/spray.
P303+P361+P353 If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P301+P330+P331 IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
WHMIS classification
D2B - Toxic material causing other toxic effects
E - Corrosive material

Classification system
HMIS ratings (scale 0-4)
(Hazardous Materials Identification System)

Health (acute effects) = 3
Flammability = 1
Physical Hazard = 1

Other hazards
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.

3 Composition/information on ingredients

Chemical characterization: Substances
CAS# Description:
376-06-7 Perfluorotetradecanoic acid
Identification number(s):
EC number: 206-803-4

4 First-aid measures

Description of first aid measures
General information Immediately remove any clothing soiled by the product.
After inhalation
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.
After skin contact
Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.

(Contd. on page 2)

Product name: Perfluorotetradecanoic acid

(Contd. of page 1)

After eye contact Rinse opened eye for several minutes under running water. Then consult a doctor.
After swallowing Seek medical treatment.
Information for doctor
Most important symptoms and effects, both acute and delayed
Causes severe skin burns.
Causes serious eye damage.
Indication of any immediate medical attention and special treatment needed No further relevant information available.

5 Fire-fighting measures

Extinguishing media
Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
Special hazards arising from the substance or mixture
If this product is involved in a fire, the following can be released:
Carbon monoxide and carbon dioxide
Hydrogen fluoride (HF)
Advice for firefighters
Protective equipment:
Wear self-contained respirator.
Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Environmental precautions: Do not allow material to be released to the environment without proper governmental permits.
Methods and material for containment and cleaning up:
Use neutralizing agent.
Dispose of contaminated material as waste according to section 13.
Ensure adequate ventilation.
Prevention of secondary hazards: No special measures required.
Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

Handling
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.
Information about protection against explosions and fires: No information known.

Conditions for safe storage, including any incompatibilities
Storage
Requirements to be met by storerooms and receptacles: No special requirements.
Information about storage in one common storage facility:
Store away from strong bases.
Store away from oxidizing agents.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Control parameters
Components with limit values that require monitoring at the workplace:
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.
Additional information: No data

Exposure controls
Personal protective equipment
General protective and hygienic measures
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Avoid contact with the eyes and skin.
Maintain an ergonomically appropriate working environment.
Breathing equipment: Use suitable respirator when high concentrations are present.
Recommended filter device for short term use:
Use a respirator with type P100 (USA) or P3 (EN 143) cartridges as a backup to engineering controls. Risk assessment should be performed to determine if air-purifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards.
Protection of hands:
Impervious gloves
Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.
Penetration time of glove material (in minutes) Not determined
Eye protection:
Tightly sealed goggles
Full face protection
Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties
General Information
Appearance:
Form: Powder

(Contd. on page 3)

Product name: Perfluorotetradecanoic acid

(Contd. of page 2)

Color:	White
Odor:	Not determined
Odor threshold:	Not determined.
pH-value:	Not applicable.
Change in condition	
Melting point/Melting range:	130-132 °C (266-270 °F)
Boiling point/Boiling range:	192 °C (378 °F) (60mm)
Sublimation temperature / start:	Not determined
Flash point:	Not applicable
Flammability (solid, gaseous)	Not determined.
Ignition temperature:	Not determined
Decomposition temperature:	Not determined
Auto igniting:	Not determined.
Danger of explosion:	Product does not present an explosion hazard.
Explosion limits:	
Lower:	Not determined
Upper:	Not determined
Vapor pressure:	Not applicable.
Density:	Not determined
Relative density	Not determined.
Vapor density	Not applicable.
Evaporation rate	Not applicable.
Solubility in / Miscibility with	
Water:	Insoluble
Partition coefficient (n-octanol/water):	Not determined.
Viscosity:	
dynamic:	Not applicable.
kinematic:	Not applicable.
Other information	No further relevant information available.

10 Stability and reactivity

Reactivity No information known.
Chemical stability Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions Reacts with strong oxidizing agents
Conditions to avoid No further relevant information available.
Incompatible materials:
Oxidizing agents
Bases
Hazardous decomposition products:
Carbon monoxide and carbon dioxide
Hydrogen fluoride

11 Toxicological information

Information on toxicological effects
Acute toxicity: Swallowing will lead to a strong corrosive effect on mouth and throat and to the danger of perforation of esophagus and stomach.
LD/LC50 values that are relevant for classification: No data
Skin irritation or corrosion: Causes severe skin burns.
Eye irritation or corrosion: Causes serious eye damage.
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: No effects known.
Carcinogenicity: No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
Reproductive toxicity: No effects known.
Specific target organ system toxicity - repeated exposure: No effects known.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: No effects known.
Subacute to chronic toxicity: No effects known.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity
Aquatic toxicity: No further relevant information available.
Persistence and degradability No further relevant information available.
Bioaccumulative potential No further relevant information available.
Mobility in soil No further relevant information available.
Additional ecological information:
General notes:
Do not allow material to be released to the environment without proper governmental permits.
Avoid transfer into the environment.
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation Consult state, local or national regulations to ensure proper disposal.
Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

UN-Number	
DOT, IMDG, IATA	UN3261
UN proper shipping name	
DOT	Corrosive solid, acidic, organic, n.o.s. (Perfluorotetradecanoic acid)

(Contd. on page 4)

Product name: Perfluorotetradecanoic acid

(Contd. of page 3)

IMDG, IATA	CORROSIVE SOLID, ACIDIC, ORGANIC, N.O.S. (Perfluorotetradecanoic acid)
Transport hazard class(es)	
DOT	
	
Class	8 Corrosive substances.
Label	8
Class	8 (C4) Corrosive substances
Label	8
IMDG, IATA	
	
Class	8 Corrosive substances.
Label	8
Packing group	
DOT, IMDG, IATA	III
Environmental hazards:	Not applicable.
Special precautions for user	Warning: Corrosive substances
EMS Number:	F-A,S-B
Segregation groups	Acids
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.
Transport/Additional information:	
DOT	
Marine Pollutant (DOT):	No
UN "Model Regulation":	UN3261, Corrosive solid, acidic, organic, n.o.s. (Perfluorotetradecanoic acid), 8, III

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture
GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)
Hazard pictograms

GHS05

Signal word Danger
Hazard statements
H314 Causes severe skin burns and eye damage.
Precautionary statements
P260 Do not breathe dust/fume/gas/mist/vapours/spray.
P303+P361+P353 If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P301+P330+P331 IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.
National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.
All components of this product are listed on the Canadian Non-Domestic Substances List (NDSL).
SARA Section 313 (specific toxic chemical listings) Substance is not listed.
California Proposition 65
Prop 65 - Chemicals known to cause cancer Substance is not listed.
Prop 65 - Developmental toxicity Substance is not listed.
Prop 65 - Developmental toxicity, female Substance is not listed.
Prop 65 - Developmental toxicity, male Substance is not listed.
Information about limitation of use: For use only by technically qualified individuals.
Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006.
This substance is included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH).
The conditions of restrictions according to Article 67 and Annex XVII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.
Substance is not listed.
Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.
Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department
Date of preparation / last revision 11/23/2015 / -
Abbreviations and acronyms:
RID: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail)
IATA-DGR: Dangerous Goods Regulations by the "International Air Transport Association" (IATA)
ICAO: International Civil Aviation Organization
ICAO-TI: Technical Instructions by the "International Civil Aviation Organization" (ICAO)
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
vPvB: very Persistent and very Bioaccumulative

(Contd. on page 5)

Product name: Perfluorotetradecanoic acid

(Contd. of page 4)

ACGIH: American Conference of Governmental Industrial Hygienists (USA)
OSHA: Occupational Safety and Health Administration (USA)
NTP: National Toxicology Program (USA)
IARC: International Agency for Research on Cancer
EPA: Environmental Protection Agency (USA)

SAFETY DATA SHEET

Version 6.2
Revision Date 07/16/2021
Print Date 10/24/2021

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Perfluorotridecanoic acid

Product Number : 654973
Brand : Aldrich
CAS-No. : 72629-94-8

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 4), H332
Carcinogenicity (Category 2), H351
Reproductive toxicity (Category 1B), H360
Effects on or via lactation, H362
Specific target organ toxicity - repeated exposure (Category 1), Liver, H372

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H302 + H332	Harmful if swallowed or if inhaled.
H351	Suspected of causing cancer.
H360	May damage fertility or the unborn child.
H362	May cause harm to breast-fed children.
H372	Causes damage to organs (Liver) through prolonged or repeated exposure.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
P263	Avoid contact during pregnancy/ while nursing.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell. Rinse mouth.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	$C_{13}HF_{25}O_2$
Molecular weight	:	664.11 g/mol
CAS-No.	:	72629-94-8
EC-No.	:	276-745-2

Component	Classification	Concentration
Perfluorotridecanoic acid		
	Acute Tox. 4; Carc. 2; Repr. 1B; Lact. ; STOT RE 1; H302, H332, H351, H360, H362, H372	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Nature of decomposition products not known.
Combustible.
Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information
Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Avoid generation and inhalation of dusts in all circumstances. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Dry. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.
Storage class (TRGS 510): 6.1C: Combustible, acute toxic Cat.3 / toxic compounds or compounds which causing chronic effects

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection
Handle with impervious gloves.

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

Body Protection
protective clothing

Respiratory protection
required when dusts are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 112 - 123 °C (234 - 253 °F) - lit.
f)	Initial boiling point and boiling range	No data available
g)	Flash point	()Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid,	No data available

	gas)	
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Density	No data available
	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Acute toxicity estimate Oral - 500.1 mg/kg
(Expert judgment)
Acute toxicity estimate Inhalation - 4 h - 11.1 mg/l
(Expert judgment)
Dermal: No data available
No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
Causes serious eye damage.

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available
No data available
No data available

Carcinogenicity
Suspected of causing cancer.

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
May damage the unborn child.
Studies indicating a hazard to babies during the lactation period

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
Causes damage to organs through prolonged or repeated exposure. - Liver

Aspiration hazard
No data available

11.2 Additional Information

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

After absorption:

gastric pain
Nausea
Vomiting
Drowsiness

somnolence

Handle in accordance with good industrial hygiene and safety practice.

SECTION 12: Ecological information

12.1 Toxicity

No data available

Toxicity to daphnia and other aquatic invertebrates	Remarks: No data available (Perfluorotridecanoic acid)
Toxicity to algae	Remarks: No data available (Perfluorotridecanoic acid)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

Discharge into the environment must be avoided.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

Further information
Not classified as dangerous in the meaning of transport regulations.

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
No SARA Hazards

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

Perfluorotridecanoic acid	CAS-No. 72629-94-8	Revision Date

New Jersey Right To Know Components

Perfluorotridecanoic acid	CAS-No. 72629-94-8	Revision Date

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.2 Revision Date: 07/16/2021 Print Date: 10/24/2021

TCI AMERICA

SAFETY DATA SHEET

Revision number: 2
Revision date: 10/06/2014

1. IDENTIFICATION

Product name: Heneicosafluoroundecanoic Acid
Product code: H1234

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborgate Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

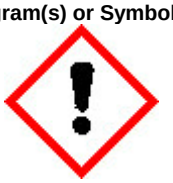
2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200: Skin Corrosion/Irritation [Category 2]
Eye Damage/Irritation [Category 2A]

Signal word: Warning!

Hazard Statement(s): Causes serious eye irritation
Causes skin irritation

Pictogram(s) or Symbol(s):



Precautionary Statement(s):

[Prevention] Wash hands and face thoroughly after handling. Wear protective gloves. Wear eye and face protection.
[Response] If on skin: Wash with plenty of water. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention.
[Storage] None
[Disposal] None

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance
Components: Heneicosafluoroundecanoic Acid
Percent: >97.0%(GC)(T)
CAS Number: 2058-94-8
Molecular Weight: 564.09
Chemical Formula: $C_{11}HF_{21}O_2$
Synonyms: Perfluoroundecanoic Acid

4. FIRST-AID MEASURES

Inhalation: Call a poison center or doctor if you feel unwell. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact: If skin irritation occurs get medical advice/attention. Remove and wash contaminated clothing before re-use. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Eye contact: IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Contact with material may irritate or burn eyes. Call emergency medical service. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Do not induce vomiting with out medical advice. If swallowed, seek medical advice immediately and show the container or label. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: Redness.
Delayed: No data available

Immediate medical attention: If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO_2 , sand, earth, water spray or regular foam Consult with local fire authorities before attempting large scale fire fighting operations.

Specific hazards arising from the chemical

Hazardous combustion products: These products include: Carbon oxides Halogenated compounds
Other specific hazards: WARNING: Highly toxic HF gas is produced during combustion.

Special precautions for fire-fighters:
Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.
Special protective equipment for fire-fighters:
Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Wear eye protection (splash goggles) and face protection (full length face shield). Lab coat. Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

Emergency procedures: Prevent dust cloud. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:
ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Ventilate the area. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material.
Environmental precautions:
Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid inhalation of vapor or mist. Avoid contact with skin and eyes. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Keep only in the original container in a cool well-ventilated place. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

Appropriate engineering controls:
Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection: Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection: Nitrile gloves.
Eye protection: Safety glasses.
Skin and body protection: Lab coat.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Solid
Form: Crystal - Powder
Color: White - Almost white
Odor: No data available
Odor threshold: No data available

Melting point/freezing point:	101°C (214°F)	**pH:**	No data available
Boiling point/range:	160°C (320°F)/8kPa	**Vapor pressure:**	No data available
Decomposition temperature:	No data available	**Vapor density:**	No data available
Relative density:	No data available	**Dynamic Viscosity:**	No data available
Kinematic Viscosity:	No data available		
Partition coefficient: n-octanol/water (log P_{ow})	No data available	**Evaporation rate:** (Butyl Acetate = 1)	No data available
Flash point:	113°C (235°F)	**Autoignition temperature:**	No data available
Flammability (solid, gas):	No data available	**Flammability or explosive limits:**	
		Lower:	No data available
		Upper:	No data available

Solubility(ies):

10. STABILITY AND REACTIVITY

Reactivity: Not Available.
Chemical Stability: Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions: No hazardous reactivity has been reported.
Conditions to avoid: Avoid excessive heat and light.
Incompatible materials: Oxidizing agents
Hazardous Decomposition Products: No data available

11. TOXICOLOGICAL INFORMATION

Acute Toxicity:
No data available

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
No data available

Carcinogenicity:

No data available

IARC: No data available **NTP:** No data available **OSHA:** No data available

Reproductive toxicity:
No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.
Symptoms related to exposure:
Skin contact may result in inflammation; characterized by itching, scaling, reddening, or occasionally blistering. Skin contact may result in redness, pain or dry skin. Eye contact may result in redness or pain.
Potential Health Effects:
Skin and eye contact may result in irritation.
Target organ(s): No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity

Fish:	No data available
Crustacea:	No data available
Algae:	No data available

Persistence and degradability:	No data available
Bioaccumulative potential (BCF):	1400 - 3500 (conc. 1 ug/L), 1300 - 5300 (conc. 0.1 ug/L)
Mobillity in soil:	No data available
Partition coefficient: n-octanol/water (log P_{ow})	No data available
Soil adsorption (Koc):	No data available
Henry's Law: constant (PaM^3/mol)	No data available

13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.
Disposal of container: Dispose of as unused product. Do not re-use empty containers.
Other considerations: Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US) Non-hazardous for transportation.

IATA Non-hazardous for transportation.

IMDG Non-hazardous for transportation.

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):
This product is NOT on the EPA Toxic Substances Control Act (TSCA) inventory. The following notices are required by 40 CFR 720.36 (C) for those products not on the inventory list:
(i) These products are supplied solely for use in research and development by or under the supervision of a technically qualified individual as defined in 40 CFR 720.0 et sec.
(ii) The health risks of these products have not been fully determined. Any information that is or becomes available will be supplied on a SDS sheet.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313:	Not Listed
SARA 302:	Not Listed

State Regulations

State Right-to-Know

Massachusetts	Not Listed
New Jersey	Not Listed
Pennsylvania	Not Listed
California Proposition 65:	Not Listed

Other Information

NFPA Rating:

Health:	1
Flammability:	0
Instability:	0

HMIS Classification:

Health:	1
Flammability:	0
Physical:	0

International Inventories

WHMIS hazard class:	D2B: Materials causing other toxic effects. (Toxic)
EC-No:	218-165-4

16. OTHER INFORMATION

Revision date: 10/06/2014
Revision number: 2
TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

Safety Data Sheet
acc. to OSHA HCS

Printing date 03/25/2019 Version Number 3 Reviewed on 01/29/2019

1 Identification

· **Product identifier**

· **Trade name: Aroclor 1016 (PCB 1016)**

· **Part number:** RPC-1016
· **CAS Number:**
12674-11-2
· **EC number:**
215-648-1
· **Index number:**
602-039-00-4
· **Application of the substance / the mixture** Reagents and Standards for Analytical Chemical Laboratory Use

· **Details of the supplier of the safety data sheet**
· **Manufacturer/Supplier:**
Agilent Technologies, Inc.
5301 Stevens Creek Blvd.
Santa Clara, CA 95051 USA

· **Information department:**
Telephone: 800-227-9770
e-mail: pdl-msds_author@agilent.com
· **Emergency telephone number:** CHEMTREC®: 1-800-424-9300

2 Hazard(s) identification

· **Classification of the substance or mixture**

GHS08 Health hazard

Carc. 1B H350 May cause cancer.
STOT RE 2 H373 May cause damage to organs through prolonged or repeated exposure.

· **Label elements**
· **GHS label elements** The substance is classified and labeled according to the Globally Harmonized System (GHS).
· **Hazard pictograms**

GHS08

· **Signal word** Danger

· **Hazard-determining components of labeling:**
Aroclor 1016 (PCB 1016)
· **Hazard statements**
May cause cancer.
May cause damage to organs through prolonged or repeated exposure.
· **Precautionary statements**
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Do not breathe dust/fume/gas/mist/vapors/spray.
Wear protective gloves/protective clothing/eye protection/face protection.
IF exposed or concerned: Get medical advice/attention.

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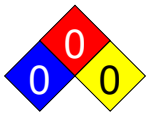
Trade name: Aroclor 1016 (PCB 1016)

(Contd. of page 1)

Get medical advice/attention if you feel unwell.
Store locked up.
Dispose of contents/container in accordance with local/regional/national/international regulations.

· **Classification system:**
· **NFPA ratings (scale 0 - 4)**



Health = 0
Fire = 0
Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**

Health = *1
Fire = 0
Reactivity = 0

· **Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

3 Composition/information on ingredients

· **Chemical characterization: Substances**
· **CAS No. Description**
12674-11-2 Aroclor 1016 (PCB 1016)
· **Identification number(s)**
· **EC number:** 215-648-1
· **Index number:** 602-039-00-4

4 First-aid measures

· **Description of first aid measures**
· **General information:**
Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:** Generally the product does not irritate the skin.
· **After eye contact:** Rinse opened eye for several minutes under running water.
· **After swallowing:** If symptoms persist consult doctor.
· **Information for doctor:**
· **Most important symptoms and effects, both acute and delayed** No further relevant information available.
· **Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

5 Fire-fighting measures

· **Extinguishing media**
· **Suitable extinguishing agents:** Use fire fighting measures that suit the environment.

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acc. to OSHA HCS

Trade name: Aroclor 1016 (PCB 1016)

(Contd. of page 2)

· **Special hazards arising from the substance or mixture**
During heating or in case of fire poisonous gases are produced.
· **Advice for firefighters**
· **Protective equipment:** Mouth respiratory protective device.

6 Accidental release measures

· **Personal precautions, protective equipment and emergency procedures** Mount respiratory protective device.
· **Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **Methods and material for containment and cleaning up:**
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Dispose contaminated material as waste according to item 13.
Ensure adequate ventilation.
· **Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.
· **Protective Action Criteria for Chemicals**

· **PAC-1:**
5.6 mg/m³

· **PAC-2:**
62 mg/m³

· **PAC-3:**
460 mg/m³

7 Handling and storage

· **Handling:**
· **Precautions for safe handling**
Ensure good ventilation/exhaustion at the workplace.
Open and handle receptacle with care.
Prevent formation of aerosols.
· **Information about protection against explosions and fires:** Keep respiratory protective device available.

· **Conditions for safe storage, including any incompatibilities**
· **Storage:**
· **Requirements to be met by storerooms and receptacles:** No special requirements.
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:** Keep receptacle tightly sealed.
· **Specific end use(s)** No further relevant information available.

8 Exposure controls/personal protection

· **Additional information about design of technical systems:** No further data; see item 7.

(Contd. on page 4)

(Contd. of page 3)

· **Control parameters**
· **Components with limit values that require monitoring at the workplace:**
The following constituent is the only constituent of the product which has a PEL, TLV or other recommended exposure limit.
The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit.
At this time, the remaining constituent has no known exposure limits.
At this time, the other constituents have no known exposure limits.
· **Additional information:** The lists that were valid during the creation were used as basis.

· **Exposure controls**
· **Personal protective equipment:**
· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Wash hands before breaks and at the end of work.
Store protective clothing separately.
· **Breathing equipment:**
When used as intended with Agilent instruments, the use of the product under normal laboratory conditions and with standard practices does not result in significant airborne exposures and therefore respiratory protection is not needed.
Under an emergency condition where a respirator is deemed necessary, use a NIOSH or equivalent approved device/equipment with appropriate organic or acid gas cartridge.
· **Protection of hands:**
Although not recommended for constant contact with the chemicals or for clean-up, nitrile gloves 11-13 mil thickness are recommended for normal use. The breakthrough time is 1 hr. For cleaning a spill where there is direct contact of the chemical, butyl rubber gloves are recommended 12-15 mil thickness with breakthrough times exceeding 4 hrs. Supplier recommendations should be followed.
· **Material of gloves**
For normal use: nitrile rubber, 11-13 mil thickness
For direct contact with the chemical: butyl rubber, 12-15 mil thickness
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.
· **Penetration time of glove material**
For normal use: nitrile rubber: 1 hour
For direct contact with the chemical: butyl rubber: >4 hours
· **Eye protection:**

Tightly sealed goggles

*
9 Physical and chemical properties

· **Information on basic physical and chemical properties**
· **General Information**
· **Appearance:**

Form:	Fluid
Color:	Not determined.
· **Odor:**	Characteristic

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(Contd. of page 4)

· **Odor threshold:**	Not determined.
· **pH-value:**	Not determined.
· **Change in condition**	
Melting point/Melting range:	Undetermined.
Boiling point/Boiling range:	Undetermined.
· **Flash point:**	Not applicable.
· **Flammability (solid, gaseous):**	Not applicable.
· **Decomposition temperature:**	Not determined.
· **Auto igniting:**	Not determined.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapor pressure:**	Not determined.
· **Density:**	Not determined.
· **Relative density**	Not determined.
· **Vapor density**	Not determined.
· **Evaporation rate**	Not determined.
· **Solubility in / Miscibility with**	
Water:	Not miscible or difficult to mix.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not determined.
Kinematic:	Not determined.
VOC content:	0.00 % 0.0 g/l / 0.00 lb/gal
· **Other information**	No further relevant information available.

10 Stability and reactivity

· **Reactivity** No further relevant information available.
· **Chemical stability**
· **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
· **Possibility of hazardous reactions** No dangerous reactions known.
· **Conditions to avoid** No further relevant information available.
· **Incompatible materials:** No further relevant information available.
· **Hazardous decomposition products:** No dangerous decomposition products known.

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Safety Data Sheet
acc. to OSHA HCS

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11 Toxicological information

· **Information on toxicological effects**
· **Acute toxicity:**

· **LD/LC50 values that are relevant for classification:**		
ATE (Acute Toxicity Estimate)		
Oral	LD50	2,300 mg/kg (rat)

12674-11-2 Aroclor 1016 (PCB 1016)		
Oral	LD50	2,300 mg/kg (rat)

· **Primary irritant effect:**
· **on the skin:** No irritant effect.
· **on the eye:** No irritating effect.
· **Sensitization:** No sensitizing effects known.
· **Additional toxicological information:**

· **Carcinogenic categories**

· **IARC (International Agency for Research on Cancer)**
Substance is not listed.

· **NTP (National Toxicology Program)**
R

· **OSHA-Ca (Occupational Safety & Health Administration)**
Substance is not listed.

12 Ecological information

· **Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **Persistence and degradability** No further relevant information available.
· **Behavior in environmental systems:**
· **Bioaccumulative potential** No further relevant information available.
· **Mobility in soil** No further relevant information available.
· **Additional ecological information:**
· **General notes:**
Water hazard class 3 (Self-assessment): extremely hazardous for water
Do not allow product to reach ground water, water course or sewage system, even in small quantities.
Danger to drinking water if even extremely small quantities leak into the ground.
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.
· **Other adverse effects** No further relevant information available.

13 Disposal considerations

· **Waste treatment methods**
· **Recommendation:**
Must not be disposed of together with household garbage. Do not allow product to reach sewage system.

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Printing date 03/25/2019 Version Number 3 Reviewed on 01/29/2019

Trade name: Aroclor 1016 (PCB 1016)

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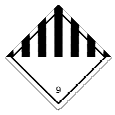
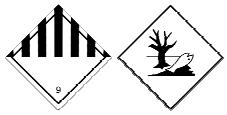
· **Uncleaned packagings:**
· **Recommendation:** Disposal must be made according to official regulations.

14 Transport information

· **UN-Number**	
· **DOT, IMDG, IATA**	UN2315
· **UN proper shipping name**	
· **DOT**	Polychlorinated biphenyls, liquid
· **IMDG**	POLYCHLORINATED BIPHENYLS, LIQUID, MARINE POLLUTANT
· **IATA**	POLYCHLORINATED BIPHENYLS, LIQUID
· **Transport hazard class(es)**	
· **DOT, IATA**	



· **Class**	9 Miscellaneous dangerous substances and articles
· **Label**	9
· **IMDG**	



· **Class**	9 Miscellaneous dangerous substances and articles
· **Label**	9
· **Packing group**	
· **DOT, IMDG, IATA**	II
· **Environmental hazards:**	Product contains environmentally hazardous substances: Aroclor 1016 (PCB 1016)
· **Marine pollutant:**	Symbol (fish and tree)
· **Special precautions for user**	Warning: Miscellaneous dangerous substances and articles
· **Danger code (Kemler):**	90
· **EMS Number:**	F-A,S-A
· **Stowage Category**	A
· **Segregation Code**	SG50 Segregation from foodstuffs as in 7.3.4.2.1, 7.6.3.1.2 or 7.7.3.6.
· **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.

(Contd. on page 8)

(Contd. of page 7)

· **Transport/Additional information:**

· **DOT**
· **Quantity limitations** On passenger aircraft/rail: 100 L
On cargo aircraft only: 220 L

· **IMDG**
· **Limited quantities (LQ)** 1L
· **Excepted quantities (EQ)** Code: E2
Maximum net quantity per inner packaging: 30 ml
Maximum net quantity per outer packaging: 500 ml

· **UN "Model Regulation":** UN 2315 POLYCHLORINATED BIPHENYLS, LIQUID, 9, II, ENVIRONMENTALLY HAZARDOUS

*

15 Regulatory information

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **Sara**

· **Section 355 (extremely hazardous substances):**
Substance is not listed.

· **Section 313 (Specific toxic chemical listings):**
Substance is not listed.

· **TSCA (Toxic Substances Control Act):**
Substance is not listed.

· **TSCA new (21st Century Act): (Substances not listed)**

12674-11-2	Aroclor 1016 (PCB 1016)

· **Proposition 65**

· **Chemicals known to cause cancer:**
Substance is not listed.

· **Chemicals known to cause reproductive toxicity for females:**
Substance is not listed.

· **Chemicals known to cause reproductive toxicity for males:**
Substance is not listed.

· **Chemicals known to cause developmental toxicity:**
Substance is not listed.

· **Carcinogenic categories**

· **EPA (Environmental Protection Agency)**
Substance is not listed.

· **TLV (Threshold Limit Value established by ACGIH)**
Substance is not listed.

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**
Substance is not listed.

(Contd. on page 9)

Safety Data Sheet
acc. to OSHA HCS

(Contd. of page 8)

· **National regulations:**

· **Information about limitation of use:**
Workers are not allowed to be exposed to this hazardous material. Exceptions can be made by the authorities in certain cases.

· **Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

16 Other information

The information contained in this document is based on Agilent's state of knowledge at the time of preparation. No warranty as to its accurateness, completeness or suitability for a particular purpose is expressed or implied.

· **Date of preparation / last revision** 03/25/2019 / 2

· **Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
VOC: Volatile Organic Compounds (USA, EU)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bioaccumulative and Toxic
vPvB: very Persistent and very Bioaccumulative
NIOSH: National Institute for Occupational Safety
OSHA: Occupational Safety & Health
TLV: Threshold Limit Value
PEL: Permissible Exposure Limit
REL: Recommended Exposure Limit
Carc. 1B: Carcinogenicity – Category 1B
STOT RE 2: Specific target organ toxicity (repeated exposure) – Category 2

· *** Data compared to the previous version altered.**

Safety Data Sheet
acc. to OSHA HCS

Printing date 03/25/2019 Version Number 4 Reviewed on 01/29/2019

*
1 Identification

· **Product identifier**

· **Trade name: Aroclor 1221 (PCB 1221)**

· **Part number:** RPC-1221
· **CAS Number:**
11104-28-2
· **EC number:**
215-648-1
· **Index number:**
602-039-00-4
· **Application of the substance / the mixture** Reagents and Standards for Analytical Chemical Laboratory Use

· **Details of the supplier of the safety data sheet**
· **Manufacturer/Supplier:**
Agilent Technologies, Inc.
5301 Stevens Creek Blvd.
Santa Clara, CA 95051 USA

· **Information department:**
Telephone: 800-227-9770
e-mail: pdl-msds_author@agilent.com
· **Emergency telephone number:** CHEMTREC®: 1-800-424-9300

*
2 Hazard(s) identification

· **Classification of the substance or mixture**


GHS08 Health hazard

STOT RE 2 H373 May cause damage to organs through prolonged or repeated exposure.

· **Label elements**
· **GHS label elements** The substance is classified and labeled according to the Globally Harmonized System (GHS).
· **Hazard pictograms**


GHS08

· **Signal word** Warning

· **Hazard-determining components of labeling:**
Aroclor 1221 (PCB 1221)
· **Hazard statements**
May cause damage to organs through prolonged or repeated exposure.
· **Precautionary statements**
Do not breathe dust/fume/gas/mist/vapors/spray.
Get medical advice/attention if you feel unwell.
Dispose of contents/container in accordance with local/regional/national/international regulations.

(Contd. on page 2)

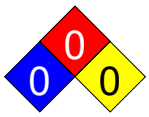
Safety Data Sheet
acc. to OSHA HCS

Printing date 03/25/2019 Version Number 4 Reviewed on 01/29/2019

Trade name: Aroclor 1221 (PCB 1221)

(Contd. of page 1)

· **Classification system:**
· **NFPA ratings (scale 0 - 4)**



Health = 0
Fire = 0
Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**

Health = 1
Fire = 0
Reactivity = 0

· **Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

3 Composition/information on ingredients

· **Chemical characterization: Substances**
· **CAS No. Description**
11104-28-2 Aroclor 1221 (PCB 1221)
· **Identification number(s)**
· **EC number:** 215-648-1
· **Index number:** 602-039-00-4

4 First-aid measures

· **Description of first aid measures**
· **General information:**
Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:** Generally the product does not irritate the skin.
· **After eye contact:** Rinse opened eye for several minutes under running water.
· **After swallowing:** If symptoms persist consult doctor.
· **Information for doctor:**
· **Most important symptoms and effects, both acute and delayed** No further relevant information available.
· **Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

5 Fire-fighting measures

· **Extinguishing media**
· **Suitable extinguishing agents:** Use fire fighting measures that suit the environment.
· **Special hazards arising from the substance or mixture**
During heating or in case of fire poisonous gases are produced.

(Contd. on page 3)

Safety Data Sheet
acc. to OSHA HCS

(Contd. of page 2)

· **Advice for firefighters**
· **Protective equipment:** Mouth respiratory protective device.

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6 Accidental release measures

· **Personal precautions, protective equipment and emergency procedures** Mount respiratory protective device.
· **Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **Methods and material for containment and cleaning up:**
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Dispose contaminated material as waste according to item 13.
Ensure adequate ventilation.
· **Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.
· **Protective Action Criteria for Chemicals**

· **PAC-1:**
12 mg/m³
· **PAC-2:**
130 mg/m³
· **PAC-3:**
790 mg/m³

7 Handling and storage

· **Handling:**
· **Precautions for safe handling**
Ensure good ventilation/exhaustion at the workplace.
Prevent formation of aerosols.
· **Information about protection against explosions and fires:** Keep respiratory protective device available.

· **Conditions for safe storage, including any incompatibilities**
· **Storage:**
· **Requirements to be met by storerooms and receptacles:** No special requirements.
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:** None.
· **Specific end use(s)** No further relevant information available.

8 Exposure controls/personal protection

· **Additional information about design of technical systems:** No further data; see item 7.

· **Control parameters**
· **Components with limit values that require monitoring at the workplace:** Not required.
· **Additional information:** The lists that were valid during the creation were used as basis.

(Contd. on page 4)

(Contd. of page 3)

· **Exposure controls**
· **Personal protective equipment:**
· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Wash hands before breaks and at the end of work.
Store protective clothing separately.
· **Breathing equipment:**
When used as intended with Agilent instruments, the use of the product under normal laboratory conditions and with standard practices does not result in significant airborne exposures and therefore respiratory protection is not needed.
Under an emergency condition where a respirator is deemed necessary, use a NIOSH or equivalent approved device/equipment with appropriate organic or acid gas cartridge.
· **Protection of hands:**
Although not recommended for constant contact with the chemicals or for clean-up, nitrile gloves 11-13 mil thickness are recommended for normal use. The breakthrough time is 1 hr. For cleaning a spill where there is direct contact of the chemical, butyl rubber gloves are recommended 12-15 mil thickness with breakthrough times exceeding 4 hrs. Supplier recommendations should be followed.
· **Material of gloves**
For normal use: nitrile rubber, 11-13 mil thickness
For direct contact with the chemical: butyl rubber, 12-15 mil thickness
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.
· **Penetration time of glove material**
For normal use: nitrile rubber: 1 hour
For direct contact with the chemical: butyl rubber: >4 hours
· **Eye protection:**

Tightly sealed goggles

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9 Physical and chemical properties

· **Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Fluid
Color:	Not determined.
· **Odor:**	Characteristic
· **Odor threshold:**	Not determined.
· **pH-value:**	Not determined.
· **Change in condition**	
Melting point/Melting range:	1 °C (33.8 °F)
Boiling point/Boiling range:	340 °C (644 °F)
· **Flash point:**	141-150 °C (285.8-302 °F)
· **Flammability (solid, gaseous):**	Not applicable.

(Contd. on page 5)

Safety Data Sheet
acc. to OSHA HCS

Trade name: Aroclor 1221 (PCB 1221)

(Contd. of page 4)

· **Decomposition temperature:**	Not determined.
· **Auto igniting:**	Not determined.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapor pressure:**	Not determined.
· **Density:**	Not determined.
· **Relative density**	Not determined.
· **Vapor density**	Not determined.
· **Evaporation rate**	Not determined.
· **Solubility in / Miscibility with**	
Water:	Not miscible or difficult to mix.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not determined.
Kinematic:	Not determined.
VOC content:	0.00 % 0.0 g/l / 0.00 lb/gal
Solids content:	0.0 %
· **Other information**	No further relevant information available.

10 Stability and reactivity

· **Reactivity** No further relevant information available.
· **Chemical stability**
· **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
· **Possibility of hazardous reactions** No dangerous reactions known.
· **Conditions to avoid** No further relevant information available.
· **Incompatible materials:** No further relevant information available.
· **Hazardous decomposition products:** No dangerous decomposition products known.

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11 Toxicological information

· **Information on toxicological effects**
· **Acute toxicity:**

· **LD/LC50 values that are relevant for classification:**		
ATE (Acute Toxicity Estimate)		
Oral	LD50	3,980 mg/kg (rat)

11104-28-2 Aroclor 1221 (PCB 1221)		
Oral	LD50	3,980 mg/kg (rat)

(Contd. on page 6)

Safety Data Sheet
acc. to OSHA HCS

Trade name: Aroclor 1221 (PCB 1221)

(Contd. of page 5)

· **Primary irritant effect:**
· **on the skin:** No irritant effect.
· **on the eye:** No irritating effect.
· **Sensitization:** No sensitizing effects known.
· **Additional toxicological information:**

· **Carcinogenic categories**

· **IARC (International Agency for Research on Cancer)**
Substance is not listed.

· **NTP (National Toxicology Program)**
Substance is not listed.

· **OSHA-Ca (Occupational Safety & Health Administration)**
Substance is not listed.

12 Ecological information

· **Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **Persistence and degradability** No further relevant information available.
· **Behavior in environmental systems:**
· **Bioaccumulative potential** No further relevant information available.
· **Mobility in soil** No further relevant information available.
· **Additional ecological information:**
· **General notes:**
Water hazard class 3 (Self-assessment): extremely hazardous for water
Do not allow product to reach ground water, water course or sewage system, even in small quantities.
Danger to drinking water if even extremely small quantities leak into the ground.
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.
· **Other adverse effects** No further relevant information available.

13 Disposal considerations

· **Waste treatment methods**
· **Recommendation:**
Must not be disposed of together with household garbage. Do not allow product to reach sewage system.

· **Uncleaned packagings:**
· **Recommendation:** Disposal must be made according to official regulations.

*
14 Transport information

· **UN-Number**	
· **DOT, IMDG, IATA**	UN2315

(Contd. on page 7)

Safety Data Sheet
acc. to OSHA HCS

Trade name: Aroclor 1221 (PCB 1221)

(Contd. of page 6)

· **UN proper shipping name**	
· **DOT**	Polychlorinated biphenyls, liquid
· **IMDG**	POLYCHLORINATED BIPHENYLS, LIQUID, MARINE POLLUTANT
· **IATA**	POLYCHLORINATED BIPHENYLS, LIQUID
· **Transport hazard class(es)**	
· **DOT, IATA**	

· **Class**	9 Miscellaneous dangerous substances and articles
· **Label**	9
· **IMDG**	

· **Class**	9 Miscellaneous dangerous substances and articles
· **Label**	9
· **Packing group**	
· **DOT**	II
· **IMDG, IATA**	III
· **Environmental hazards:**	Product contains environmentally hazardous substances: Aroclor 1221 (PCB 1221)
· **Marine pollutant:**	Symbol (fish and tree)
· **Special precautions for user**	Warning: Miscellaneous dangerous substances and articles
· **Danger code (Kemler):**	90
· **EMS Number:**	F-A,S-A
· **Stowage Category**	A
· **Segregation Code**	SG50 Segregation from foodstuffs as in 7.3.4.2.1, 7.6.3.1.2 or 7.7.3.6.
· **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **Transport/Additional information:**	
· **DOT**	
· **Quantity limitations**	On passenger aircraft/rail: 100 L On cargo aircraft only: 220 L
· **IMDG**	
· **Limited quantities (LQ)**	5L
· **Excepted quantities (EQ)**	Code: E1 Maximum net quantity per inner packaging: 30 ml Maximum net quantity per outer packaging: 1000 ml

(Contd. on page 8)

Safety Data Sheet
acc. to OSHA HCS

(Contd. of page 7)

· **UN "Model Regulation":**	UN 2315 POLYCHLORINATED BIPHENYLS, LIQUID, 9, II, ENVIRONMENTALLY HAZARDOUS

*
15 Regulatory information

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **Sara**

· **Section 355 (extremely hazardous substances):**
Substance is not listed.

· **Section 313 (Specific toxic chemical listings):**
Substance is not listed.

· **TSCA (Toxic Substances Control Act):**
Substance is not listed.

· **TSCA new (21st Century Act): (Substances not listed)**

11104-28-2	Aroclor 1221 (PCB 1221)

· **Proposition 65**

· **Chemicals known to cause cancer:**
Substance is not listed.

· **Chemicals known to cause reproductive toxicity for females:**
Substance is not listed.

· **Chemicals known to cause reproductive toxicity for males:**
Substance is not listed.

· **Chemicals known to cause developmental toxicity:**
Substance is not listed.

· **Carcinogenic categories**

· **EPA (Environmental Protection Agency)**
Substance is not listed.

· **TLV (Threshold Limit Value established by ACGIH)**
Substance is not listed.

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**
Substance is not listed.

· **Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

16 Other information

The information contained in this document is based on Agilent's state of knowledge at the time of preparation. No warranty as to its accurateness, completeness or suitability for a particular purpose is expressed or implied.

· **Department issuing SDS:** Document Control / Regulatory
· **Contact:** regulatory@ultrasci.com
· **Date of preparation / last revision** 03/25/2019 / 3
· **Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)

(Contd. on page 9)

Safety Data Sheet
acc. to OSHA HCS

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Trade name: Aroclor 1221 (PCB 1221)

(Contd. of page 8)

IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
VOC: Volatile Organic Compounds (USA, EU)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bioaccumulative and Toxic
vPvB: very Persistent and very Bioaccumulative
NIOSH: National Institute for Occupational Safety
OSHA: Occupational Safety & Health
TLV: Threshold Limit Value
PEL: Permissible Exposure Limit
REL: Recommended Exposure Limit
STOT RE 2: Specific target organ toxicity (repeated exposure) – Category 2

· *** Data compared to the previous version altered.**

Safety Data Sheet
acc. to OSHA HCS

Printing date 03/25/2019 Version Number 2 Reviewed on 03/25/2019

*

1 Identification

· **Product identifier**

· **Trade name: Aroclor 1232 (PCB 1232)**

· **Part number:** RPC-1232
· **CAS Number:**
11141-16-5
· **EC number:**
215-648-1
· **Index number:**
602-039-00-4
· **Application of the substance / the mixture** Reagents and Standards for Analytical Chemical Laboratory Use

· **Details of the supplier of the safety data sheet**
· **Manufacturer/Supplier:**
Agilent Technologies, Inc.
5301 Stevens Creek Blvd.
Santa Clara, CA 95051 USA

· **Information department:**
Telephone: 800-227-9770
e-mail: pdl-msds_author@agilent.com
· **Emergency telephone number:** CHEMTREC®: 1-800-424-9300

2 Hazard(s) identification

· **Classification of the substance or mixture**

GHS08 Health hazard

STOT RE 2 H373 May cause damage to organs through prolonged or repeated exposure.

· **Label elements**
· **GHS label elements** The substance is classified and labeled according to the Globally Harmonized System (GHS).
· **Hazard pictograms**

GHS08

· **Signal word** Warning

· **Hazard-determining components of labeling:**
Aroclor 1232 (PCB 1232)
· **Hazard statements**
May cause damage to organs through prolonged or repeated exposure.
· **Precautionary statements**
Do not breathe dust/fume/gas/mist/vapors/spray.
Get medical advice/attention if you feel unwell.
Dispose of contents/container in accordance with local/regional/national/international regulations.

(Contd. on page 2)

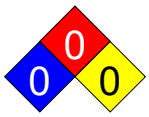
Safety Data Sheet
acc. to OSHA HCS

Printing date 03/25/2019 Version Number 2 Reviewed on 03/25/2019

Trade name: Aroclor 1232 (PCB 1232)

(Contd. of page 1)

· **Classification system:**
· **NFPA ratings (scale 0 - 4)**



Health = 0
Fire = 0
Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**

Health = 1
Fire = 0
Reactivity = 0

· **Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

3 Composition/information on ingredients

· **Chemical characterization: Substances**
· **CAS No. Description**
11141-16-5 Aroclor 1232 (PCB 1232)
· **Identification number(s)**
· **EC number:** 215-648-1
· **Index number:** 602-039-00-4

4 First-aid measures

· **Description of first aid measures**
· **General information:**
Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:** Generally the product does not irritate the skin.
· **After eye contact:** Rinse opened eye for several minutes under running water.
· **After swallowing:** If symptoms persist consult doctor.
· **Information for doctor:**
· **Most important symptoms and effects, both acute and delayed** No further relevant information available.
· **Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

5 Fire-fighting measures

· **Extinguishing media**
· **Suitable extinguishing agents:** Use fire fighting measures that suit the environment.
· **Special hazards arising from the substance or mixture**
During heating or in case of fire poisonous gases are produced.

(Contd. on page 3)

Safety Data Sheet
acc. to OSHA HCS

(Contd. of page 2)

· **Advice for firefighters**
· **Protective equipment:** Mouth respiratory protective device.

6 Accidental release measures

· **Personal precautions, protective equipment and emergency procedures** Mount respiratory protective device.
· **Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **Methods and material for containment and cleaning up:**
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Dispose contaminated material as waste according to item 13.
Ensure adequate ventilation.
· **Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.
· **Protective Action Criteria for Chemicals**

· **PAC-1:**
13 mg/m³
· **PAC-2:**
150 mg/m³
· **PAC-3:**
890 mg/m³

7 Handling and storage

· **Handling:**
· **Precautions for safe handling**
Ensure good ventilation/exhaustion at the workplace.
Prevent formation of aerosols.
· **Information about protection against explosions and fires:** Keep respiratory protective device available.

· **Conditions for safe storage, including any incompatibilities**
· **Storage:**
· **Requirements to be met by storerooms and receptacles:** No special requirements.
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:** None.
· **Specific end use(s)** No further relevant information available.

*
8 Exposure controls/personal protection

· **Additional information about design of technical systems:** No further data; see item 7.

· **Control parameters**
· **Components with limit values that require monitoring at the workplace:**
The following constituent is the only constituent of the product which has a PEL, TLV or other recommended exposure limit.
The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit.
At this time, the remaining constituent has no known exposure limits.

(Contd. on page 4)

(Contd. of page 3)

At this time, the other constituents have no known exposure limits.

· **Additional information:** The lists that were valid during the creation were used as basis.

· **Exposure controls**
· **Personal protective equipment:**
· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Wash hands before breaks and at the end of work.
Store protective clothing separately.
· **Breathing equipment:**
When used as intended with Agilent instruments, the use of the product under normal laboratory conditions and with standard practices does not result in significant airborne exposures and therefore respiratory protection is not needed.
Under an emergency condition where a respirator is deemed necessary, use a NIOSH or equivalent approved device/equipment with appropriate organic or acid gas cartridge.
· **Protection of hands:**
Although not recommended for constant contact with the chemicals or for clean-up, nitrile gloves 11-13 mil thickness are recommended for normal use. The breakthrough time is 1 hr. For cleaning a spill where there is direct contact of the chemical, butyl rubber gloves are recommended 12-15 mil thickness with breakthrough times exceeding 4 hrs. Supplier recommendations should be followed.
· **Material of gloves**
For normal use: nitrile rubber, 11-13 mil thickness
For direct contact with the chemical: butyl rubber, 12-15 mil thickness
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.
· **Penetration time of glove material**
For normal use: nitrile rubber: 1 hour
For direct contact with the chemical: butyl rubber: >4 hours
· **Eye protection:**

Tightly sealed goggles

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9 Physical and chemical properties

· **Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Fluid
Color:	Not determined.
· **Odor:**	Characteristic
· **Odor threshold:**	Not determined.
· **pH-value:**	Not determined.
· **Change in condition**	
Melting point/Melting range:	Undetermined.
Boiling point/Boiling range:	Undetermined.
· **Flash point:**	Not applicable.

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Safety Data Sheet
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· **Flammability (solid, gaseous):**	Not applicable.
· **Decomposition temperature:**	Not determined.
· **Auto igniting:**	Not determined.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapor pressure:**	Not determined.
· **Density:**	Not determined.
· **Relative density**	Not determined.
· **Vapor density**	Not determined.
· **Evaporation rate**	Not determined.
· **Solubility in / Miscibility with**	
Water:	Not miscible or difficult to mix.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not determined.
Kinematic:	Not determined.
VOC content:	0.00 % 0.0 g/l / 0.00 lb/gal
· **Other information**	No further relevant information available.

10 Stability and reactivity

· **Reactivity** No further relevant information available.
· **Chemical stability**
· **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
· **Possibility of hazardous reactions** No dangerous reactions known.
· **Conditions to avoid** No further relevant information available.
· **Incompatible materials:** No further relevant information available.
· **Hazardous decomposition products:** No dangerous decomposition products known.

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11 Toxicological information

· **Information on toxicological effects**
· **Acute toxicity:**

· **LD/LC50 values that are relevant for classification:**		
ATE (Acute Toxicity Estimate)		
Oral	LD50	4,470 mg/kg (rat)

11141-16-5 Aroclor 1232 (PCB 1232)		
Oral	LD50	4,470 mg/kg (rat)

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Trade name: Aroclor 1232 (PCB 1232)

(Contd. of page 5)

· **Primary irritant effect:**
· **on the skin:** No irritant effect.
· **on the eye:** No irritating effect.
· **Sensitization:** No sensitizing effects known.
· **Additional toxicological information:**

· **Carcinogenic categories**

· **IARC (International Agency for Research on Cancer)**
Substance is not listed.

· **NTP (National Toxicology Program)**
Substance is not listed.

· **OSHA-Ca (Occupational Safety & Health Administration)**
Substance is not listed.

12 Ecological information

· **Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **Persistence and degradability** No further relevant information available.
· **Behavior in environmental systems:**
· **Bioaccumulative potential** No further relevant information available.
· **Mobility in soil** No further relevant information available.
· **Additional ecological information:**
· **General notes:**
Water hazard class 3 (Self-assessment): extremely hazardous for water
Do not allow product to reach ground water, water course or sewage system, even in small quantities.
Danger to drinking water if even extremely small quantities leak into the ground.
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.
· **Other adverse effects** No further relevant information available.

13 Disposal considerations

· **Waste treatment methods**
· **Recommendation:**
Must not be disposed of together with household garbage. Do not allow product to reach sewage system.

· **Uncleaned packagings:**
· **Recommendation:** Disposal must be made according to official regulations.

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14 Transport information

· **UN-Number**	
· **DOT, IMDG, IATA**	UN2315

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Trade name: Aroclor 1232 (PCB 1232)

(Contd. of page 6)

· **UN proper shipping name**	
· **DOT**	Polychlorinated biphenyls, liquid
· **IMDG**	POLYCHLORINATED BIPHENYLS, LIQUID, MARINE POLLUTANT
· **IATA**	POLYCHLORINATED BIPHENYLS, LIQUID
· **Transport hazard class(es)**	
· **DOT, IATA**	

· **Class**	9 Miscellaneous dangerous substances and articles
· **Label**	9
· **IMDG**	

· **Class**	9 Miscellaneous dangerous substances and articles
· **Label**	9
· **Packing group**	
· **DOT, IMDG, IATA**	II
· **Environmental hazards:**	Product contains environmentally hazardous substances: Aroclor 1232 (PCB 1232)
· **Marine pollutant:**	Symbol (fish and tree)
· **Special precautions for user**	Warning: Miscellaneous dangerous substances and articles
· **Danger code (Kemler):**	90
· **EMS Number:**	F-A,S-A
· **Stowage Category**	A
· **Segregation Code**	SG50 Segregation from foodstuffs as in 7.3.4.2.1, 7.6.3.1.2 or 7.7.3.6.
· **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **Transport/Additional information:**	
· **DOT**	
· **Quantity limitations**	On passenger aircraft/rail: 100 L On cargo aircraft only: 220 L
· **IMDG**	
· **Limited quantities (LQ)**	1L
· **Excepted quantities (EQ)**	Code: E2 Maximum net quantity per inner packaging: 30 ml Maximum net quantity per outer packaging: 500 ml

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· **UN "Model Regulation":**	UN 2315 POLYCHLORINATED BIPHENYLS, LIQUID, 9, II, ENVIRONMENTALLY HAZARDOUS

15 Regulatory information

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **Sara**

· **Section 355 (extremely hazardous substances):**
Substance is not listed.

· **Section 313 (Specific toxic chemical listings):**
Substance is not listed.

· **TSCA (Toxic Substances Control Act):**
Substance is not listed.

· **TSCA new (21st Century Act): (Substances not listed)**

11141-16-5	Aroclor 1232 (PCB 1232)

· **Proposition 65**

· **Chemicals known to cause cancer:**
Substance is not listed.

· **Chemicals known to cause reproductive toxicity for females:**
Substance is not listed.

· **Chemicals known to cause reproductive toxicity for males:**
Substance is not listed.

· **Chemicals known to cause developmental toxicity:**
Substance is not listed.

· **Carcinogenic categories**

· **EPA (Environmental Protection Agency)**
Substance is not listed.

· **TLV (Threshold Limit Value established by ACGIH)**
Substance is not listed.

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**
Substance is not listed.

· **Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

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16 Other information

The information contained in this document is based on Agilent's state of knowledge at the time of preparation. No warranty as to its accurateness, completeness or suitability for a particular purpose is expressed or implied.

· **Department issuing SDS:** Document Control / Regulatory
· **Contact:** regulatory@ultrasci.com
· **Date of preparation / last revision** 03/25/2019 / 1
· **Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)

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Trade name: Aroclor 1232 (PCB 1232)

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IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
VOC: Volatile Organic Compounds (USA, EU)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bioaccumulative and Toxic
vPvB: very Persistent and very Bioaccumulative
NIOSH: National Institute for Occupational Safety
OSHA: Occupational Safety & Health
TLV: Threshold Limit Value
PEL: Permissible Exposure Limit
REL: Recommended Exposure Limit
STOT RE 2: Specific target organ toxicity (repeated exposure) – Category 2

· *** Data compared to the previous version altered.**

Safety Data Sheet
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*
1 Identification

· **Product identifier**

· **Trade name: Aroclor 1242 (PCB 1242)**

· **Part number:** RPC-1242, RPC-1242-1
· **CAS Number:**
53469-21-9
· **EC number:**
215-648-1
· **Index number:**
602-039-00-4
· **Application of the substance / the mixture** Reagents and Standards for Analytical Chemical Laboratory Use

· **Details of the supplier of the safety data sheet**
· **Manufacturer/Supplier:**
Agilent Technologies, Inc.
5301 Stevens Creek Blvd.
Santa Clara, CA 95051 USA

· **Information department:**
Telephone: 800-227-9770
e-mail: pdl-msds_author@agilent.com
· **Emergency telephone number:** CHEMTREC®: 1-800-424-9300

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2 Hazard(s) identification

· **Classification of the substance or mixture**

GHS08 Health hazard

Carc. 1B H350 May cause cancer.
STOT RE 1 H372 Causes damage to organs through prolonged or repeated exposure.

· **Label elements**
· **GHS label elements** The substance is classified and labeled according to the Globally Harmonized System (GHS).
· **Hazard pictograms**

GHS08

· **Signal word** Danger

· **Hazard-determining components of labeling:**
Aroclor 1242 (PCB 1242)
· **Hazard statements**
May cause cancer.
Causes damage to organs through prolonged or repeated exposure.
· **Precautionary statements**
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Do not breathe dust/fume/gas/mist/vapors/spray.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.

(Contd. on page 2)

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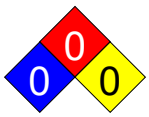
Trade name: Aroclor 1242 (PCB 1242)

(Contd. of page 1)

Wear protective gloves/protective clothing/eye protection/face protection.
IF exposed or concerned: Get medical advice/attention.
Get medical advice/attention if you feel unwell.
Store locked up.
Dispose of contents/container in accordance with local/regional/national/international regulations.

· **Classification system:**
· **NFPA ratings (scale 0 - 4)**



Health = 0
Fire = 0
Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**

Health = *1
Fire = 0
Reactivity = 0

· **Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

3 Composition/information on ingredients

· **Chemical characterization: Substances**
· **CAS No. Description**
53469-21-9 Aroclor 1242 (PCB 1242)
· **Identification number(s)**
· **EC number:** 215-648-1
· **Index number:** 602-039-00-4

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4 First-aid measures

· **Description of first aid measures**
· **General information:**
Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:** Generally the product does not irritate the skin.
· **After eye contact:** Rinse opened eye for several minutes under running water.
· **After swallowing:** If symptoms persist consult doctor.
· **Information for doctor:**
· **Most important symptoms and effects, both acute and delayed** No further relevant information available.
· **Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

(Contd. on page 3)

Safety Data Sheet
acc. to OSHA HCS

(Contd. of page 2)

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5 Fire-fighting measures

· **Extinguishing media**
· **Suitable extinguishing agents:** Use fire fighting measures that suit the environment.
· **Special hazards arising from the substance or mixture**
During heating or in case of fire poisonous gases are produced.
· **Advice for firefighters**
· **Protective equipment:** Mouth respiratory protective device.

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6 Accidental release measures

· **Personal precautions, protective equipment and emergency procedures** Mount respiratory protective device.
· **Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **Methods and material for containment and cleaning up:**
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Dispose contaminated material as waste according to item 13.
Ensure adequate ventilation.
· **Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.
· **Protective Action Criteria for Chemicals**

· **PAC-1:**
3 mg/m³
· **PAC-2:**
140 mg/m³
· **PAC-3:**
840 mg/m³

*
7 Handling and storage

· **Handling:**
· **Precautions for safe handling**
Ensure good ventilation/exhaustion at the workplace.
Open and handle receptacle with care.
Prevent formation of aerosols.
· **Information about protection against explosions and fires:** Keep respiratory protective device available.

· **Conditions for safe storage, including any incompatibilities**
· **Storage:**
· **Requirements to be met by storerooms and receptacles:** No special requirements.
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:** Keep receptacle tightly sealed.
· **Specific end use(s)** No further relevant information available.

(Contd. on page 4)

(Contd. of page 3)

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8 Exposure controls/personal protection

· **Additional information about design of technical systems:** No further data; see item 7.

· **Control parameters**

· **Components with limit values that require monitoring at the workplace:**
The following constituent is the only constituent of the product which has a PEL, TLV or other recommended exposure limit.
The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit.
At this time, the remaining constituent has no known exposure limits.
At this time, the other constituents have no known exposure limits.

53469-21-9 Aroclor 1242 (PCB 1242)	
PEL	Long-term value: 1 mg/m³ Skin
REL	Long-term value: 0.001 mg/m³ See Pocket Guide App. A
TLV	Long-term value: 1 mg/m³ Skin

· **Additional information:** The lists that were valid during the creation were used as basis.

· **Exposure controls**

· **Personal protective equipment:**

· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Wash hands before breaks and at the end of work.
Store protective clothing separately.

· **Breathing equipment:**
When used as intended with Agilent instruments, the use of the product under normal laboratory conditions and with standard practices does not result in significant airborne exposures and therefore respiratory protection is not needed.
Under an emergency condition where a respirator is deemed necessary, use a NIOSH or equivalent approved device/equipment with appropriate organic or acid gas cartridge.

· **Protection of hands:**
Although not recommended for constant contact with the chemicals or for clean-up, nitrile gloves 11-13 mil thickness are recommended for normal use. The breakthrough time is 1 hr. For cleaning a spill where there is direct contact of the chemical, butyl rubber gloves are recommended 12-15 mil thickness with breakthrough times exceeding 4 hrs. Supplier recommendations should be followed.

· **Material of gloves**
For normal use: nitrile rubber, 11-13 mil thickness
For direct contact with the chemical: butyl rubber, 12-15 mil thickness
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.

· **Penetration time of glove material**
For normal use: nitrile rubber: 1 hour
For direct contact with the chemical: butyl rubber: >4 hours

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Safety Data Sheet
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Trade name: Aroclor 1242 (PCB 1242)

(Contd. of page 4)

· **Eye protection:**

Tightly sealed goggles

*

9 Physical and chemical properties

· **Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Fluid
Color:	Not determined.
· **Odor:**	Characteristic
· **Odor threshold:**	Not determined.
· **pH-value:**	Not determined.
· **Change in condition**	
Melting point/Melting range:	Undetermined.
Boiling point/Boiling range:	Undetermined.
· **Flash point:**	Not applicable.
· **Flammability (solid, gaseous):**	Not applicable.
· **Decomposition temperature:**	Not determined.
· **Auto igniting:**	Not determined.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapor pressure:**	Not determined.
· **Density:**	Not determined.
· **Relative density**	Not determined.
· **Vapor density**	Not determined.
· **Evaporation rate**	Not determined.
· **Solubility in / Miscibility with**	
Water:	Not miscible or difficult to mix.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not determined.
Kinematic:	Not determined.
VOC content:	0.00 % 0.0 g/l / 0.00 lb/gal
· **Other information**	No further relevant information available.

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Safety Data Sheet
acc. to OSHA HCS

Trade name: Aroclor 1242 (PCB 1242)

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10 Stability and reactivity

· **Reactivity** No further relevant information available.
· **Chemical stability**
· **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
· **Possibility of hazardous reactions** No dangerous reactions known.
· **Conditions to avoid** No further relevant information available.
· **Incompatible materials:** No further relevant information available.
· **Hazardous decomposition products:** No dangerous decomposition products known.

*
11 Toxicological information

· **Information on toxicological effects**
· **Acute toxicity:**

· **LD/LC50 values that are relevant for classification:**		
ATE (Acute Toxicity Estimate)		
Oral	LD50	4,250 mg/kg (rat)

53469-21-9 Aroclor 1242 (PCB 1242)		
Oral	LD50	4,250 mg/kg (rat)

· **Primary irritant effect:**
· **on the skin:** No irritant effect.
· **on the eye:** No irritating effect.
· **Sensitization:** No sensitizing effects known.
· **Additional toxicological information:**

· **Carcinogenic categories**

· **IARC (International Agency for Research on Cancer)**
2A

· **NTP (National Toxicology Program)**
Substance is not listed.

· **OSHA-Ca (Occupational Safety & Health Administration)**
Substance is not listed.

12 Ecological information

· **Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **Persistence and degradability** No further relevant information available.
· **Behavior in environmental systems:**
· **Bioaccumulative potential** No further relevant information available.
· **Mobility in soil** No further relevant information available.
· **Additional ecological information:**
· **General notes:**
Water hazard class 1 (Self-assessment): slightly hazardous for water
Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.

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Safety Data Sheet
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(Contd. of page 6)

· **vPvB:** Not applicable.
· **Other adverse effects** No further relevant information available.

13 Disposal considerations

· **Waste treatment methods**
· **Recommendation:**
Must not be disposed of together with household garbage. Do not allow product to reach sewage system.

· **Uncleaned packagings:**
· **Recommendation:** Disposal must be made according to official regulations.

*
14 Transport information

· **UN-Number**	
· **DOT, IMDG, IATA**	UN2315
· **UN proper shipping name**	
· **DOT**	Polychlorinated biphenyls, liquid
· **IMDG**	POLYCHLORINATED BIPHENYLS, LIQUID, MARINE POLLUTANT
· **IATA**	POLYCHLORINATED BIPHENYLS, LIQUID
· **Transport hazard class(es)**	
· **DOT, IATA**	

· **Class**	9 Miscellaneous dangerous substances and articles
· **Label**	9
· **IMDG**	

· **Class**	9 Miscellaneous dangerous substances and articles
· **Label**	9
· **Packing group**	
· **DOT, IMDG, IATA**	II
· **Environmental hazards:**	
· **Marine pollutant:**	Symbol (fish and tree)
· **Special precautions for user**	Warning: Miscellaneous dangerous substances and articles
· **Danger code (Kemler):**	90
· **EMS Number:**	6.1-02
· **Stowage Category**	A

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· **Segregation Code**	SG50 Segregation from foodstuffs as in 7.3.4.2.1, 7.6.3.1.2 or 7.7.3.6.
· **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **Transport/Additional information:**	
· **DOT**	
· **Quantity limitations**	On passenger aircraft/rail: 100 L On cargo aircraft only: 220 L
· **Hazardous substance:**	1 lbs, 0.454 kg
· **IMDG**	
· **Limited quantities (LQ)**	1L
· **Excepted quantities (EQ)**	Code: E2 Maximum net quantity per inner packaging: 30 ml Maximum net quantity per outer packaging: 500 ml
· **UN "Model Regulation":**	UN 2315 POLYCHLORINATED BIPHENYLS, LIQUID, 9, II, ENVIRONMENTALLY HAZARDOUS

*
15 Regulatory information

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **Sara**

· **Section 355 (extremely hazardous substances):**
Substance is not listed.

· **Section 313 (Specific toxic chemical listings):**
Substance is not listed.

· **TSCA (Toxic Substances Control Act):**
Substance is not listed.

· **TSCA new (21st Century Act): (Substances not listed)**

53469-21-9	Aroclor 1242 (PCB 1242)

· **Proposition 65**

· **Chemicals known to cause cancer:**
Substance is not listed.

· **Chemicals known to cause reproductive toxicity for females:**
Substance is not listed.

· **Chemicals known to cause reproductive toxicity for males:**
Substance is not listed.

· **Chemicals known to cause developmental toxicity:**
Substance is not listed.

· **Carcinogenic categories**

· **EPA (Environmental Protection Agency)**

B2

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· **TLV (Threshold Limit Value established by ACGIH)**

Substance is not listed.

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**

Substance is listed.

· **National regulations:**

· **Information about limitation of use:**
Workers are not allowed to be exposed to this hazardous material. Exceptions can be made by the authorities in certain cases.

· **Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

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16 Other information

The information contained in this document is based on Agilent's state of knowledge at the time of preparation. No warranty as to its accurateness, completeness or suitability for a particular purpose is expressed or implied.

· **Department issuing SDS:** Document Control / Regulatory
· **Contact:** regulatory@ultrasci.com
· **Date of preparation / last revision** 03/25/2019 / 1
· **Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
VOC: Volatile Organic Compounds (USA, EU)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bioaccumulative and Toxic
vPvB: very Persistent and very Bioaccumulative
NIOSH: National Institute for Occupational Safety
OSHA: Occupational Safety & Health
TLV: Threshold Limit Value
PEL: Permissible Exposure Limit
REL: Recommended Exposure Limit
Carc. 1B: Carcinogenicity – Category 1B
STOT RE 1: Specific target organ toxicity (repeated exposure) – Category 1
· *** Data compared to the previous version altered.**

Safety Data Sheet
acc. to OSHA HCS

Printing date 03/25/2019 Version Number 3 Reviewed on 03/25/2019

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1 Identification

· **Product identifier**

· **Trade name: Aroclor 1248 (PCB 1248)**

· **Part number:** RPC-1248, RPC-1248-500MG
· **CAS Number:**
12672-29-6
· **EC number:**
215-648-1
· **Index number:**
602-039-00-4
· **Application of the substance / the mixture** Reagents and Standards for Analytical Chemical Laboratory Use

· **Details of the supplier of the safety data sheet**
· **Manufacturer/Supplier:**
Agilent Technologies, Inc.
5301 Stevens Creek Blvd.
Santa Clara, CA 95051 USA

· **Information department:**
Telephone: 800-227-9770
e-mail: pdl-msds_author@agilent.com
· **Emergency telephone number:** CHEMTREC®: 1-800-424-9300

2 Hazard(s) identification

· **Classification of the substance or mixture**

GHS08 Health hazard

STOT RE 2 H373 May cause damage to organs through prolonged or repeated exposure.

· **Label elements**
· **GHS label elements** The substance is classified and labeled according to the Globally Harmonized System (GHS).
· **Hazard pictograms**

GHS08

· **Signal word** Warning

· **Hazard-determining components of labeling:**
Aroclor 1248 (PCB 1248)
· **Hazard statements**
May cause damage to organs through prolonged or repeated exposure.
· **Precautionary statements**
Do not breathe dust/fume/gas/mist/vapors/spray.
Get medical advice/attention if you feel unwell.
Dispose of contents/container in accordance with local/regional/national/international regulations.

(Contd. on page 2)

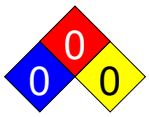
Safety Data Sheet
acc. to OSHA HCS

Printing date 03/25/2019 Version Number 3 Reviewed on 03/25/2019

Trade name: Aroclor 1248 (PCB 1248)

(Contd. of page 1)

· **Classification system:**
· **NFPA ratings (scale 0 - 4)**



Health = 0
Fire = 0
Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**

Health = 0
Fire = 0
Reactivity = 0

· **Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

3 Composition/information on ingredients

· **Chemical characterization: Substances**
· **CAS No. Description**
12672-29-6 Aroclor 1248 (PCB 1248)
· **Identification number(s)**
· **EC number:** 215-648-1
· **Index number:** 602-039-00-4

4 First-aid measures

· **Description of first aid measures**
· **General information:**
Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:** Generally the product does not irritate the skin.
· **After eye contact:** Rinse opened eye for several minutes under running water.
· **After swallowing:** If symptoms persist consult doctor.
· **Information for doctor:**
· **Most important symptoms and effects, both acute and delayed** No further relevant information available.
· **Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

5 Fire-fighting measures

· **Extinguishing media**
· **Suitable extinguishing agents:** Use fire fighting measures that suit the environment.
· **Special hazards arising from the substance or mixture**
During heating or in case of fire poisonous gases are produced.

(Contd. on page 3)

Safety Data Sheet
acc. to OSHA HCS

Trade name: Aroclor 1248 (PCB 1248)

(Contd. of page 2)

· **Advice for firefighters**
· **Protective equipment:** Mouth respiratory protective device.

6 Accidental release measures

· **Personal precautions, protective equipment and emergency procedures** Mount respiratory protective device.
· **Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **Methods and material for containment and cleaning up:**
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Dispose contaminated material as waste according to item 13.
Ensure adequate ventilation.
· **Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.
· **Protective Action Criteria for Chemicals**

· **PAC-1:**
6.6 mg/m³
· **PAC-2:**
72 mg/m³
· **PAC-3:**
2,200 mg/m³

7 Handling and storage

· **Handling:**
· **Precautions for safe handling**
Ensure good ventilation/exhaustion at the workplace.
Prevent formation of aerosols.
· **Information about protection against explosions and fires:** Keep respiratory protective device available.

· **Conditions for safe storage, including any incompatibilities**
· **Storage:**
· **Requirements to be met by storerooms and receptacles:** No special requirements.
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:** None.
· **Specific end use(s)** No further relevant information available.

8 Exposure controls/personal protection

· **Additional information about design of technical systems:** No further data; see item 7.

· **Control parameters**
· **Components with limit values that require monitoring at the workplace:**
The following constituent is the only constituent of the product which has a PEL, TLV or other recommended exposure limit.
The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit.
At this time, the remaining constituent has no known exposure limits.

(Contd. on page 4)

(Contd. of page 3)

At this time, the other constituents have no known exposure limits.

· **Additional information:** The lists that were valid during the creation were used as basis.

· **Exposure controls**
· **Personal protective equipment:**
· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Wash hands before breaks and at the end of work.
Store protective clothing separately.
· **Breathing equipment:**
When used as intended with Agilent instruments, the use of the product under normal laboratory conditions and with standard practices does not result in significant airborne exposures and therefore respiratory protection is not needed.
Under an emergency condition where a respirator is deemed necessary, use a NIOSH or equivalent approved device/equipment with appropriate organic or acid gas cartridge.
· **Protection of hands:**
Although not recommended for constant contact with the chemicals or for clean-up, nitrile gloves 11-13 mil thickness are recommended for normal use. The breakthrough time is 1 hr. For cleaning a spill where there is direct contact of the chemical, butyl rubber gloves are recommended 12-15 mil thickness with breakthrough times exceeding 4 hrs. Supplier recommendations should be followed.
· **Material of gloves**
For normal use: nitrile rubber, 11-13 mil thickness
For direct contact with the chemical: butyl rubber, 12-15 mil thickness
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.
· **Penetration time of glove material**
For normal use: nitrile rubber: 1 hour
For direct contact with the chemical: butyl rubber: >4 hours
· **Eye protection:**

Tightly sealed goggles

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9 Physical and chemical properties

· **Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Fluid
Color:	Not determined.
· **Odor:**	Characteristic
· **Odor threshold:**	Not determined.
· **pH-value:**	Not determined.
· **Change in condition**	
Melting point/Melting range:	Undetermined.
Boiling point/Boiling range:	Undetermined.
· **Flash point:**	Not applicable.

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Safety Data Sheet
acc. to OSHA HCS

(Contd. of page 4)

· **Flammability (solid, gaseous):**	Not applicable.
· **Decomposition temperature:**	Not determined.
· **Auto igniting:**	Not determined.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapor pressure:**	Not determined.
· **Density:**	Not determined.
· **Relative density**	Not determined.
· **Vapor density**	Not determined.
· **Evaporation rate**	Not determined.
· **Solubility in / Miscibility with**	
Water:	Not miscible or difficult to mix.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not determined.
Kinematic:	Not determined.
VOC content:	0.00 % 0.0 g/l / 0.00 lb/gal
· **Other information**	No further relevant information available.

10 Stability and reactivity

· **Reactivity** No further relevant information available.
· **Chemical stability**
· **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
· **Possibility of hazardous reactions** No dangerous reactions known.
· **Conditions to avoid** No further relevant information available.
· **Incompatible materials:** No further relevant information available.
· **Hazardous decomposition products:** No dangerous decomposition products known.

*
11 Toxicological information

· **Information on toxicological effects**
· **Acute toxicity:**

· **LD/LC50 values that are relevant for classification:**		
12672-29-6 Aroclor 1248 (PCB 1248)		
Oral	LD50	11,000 mg/kg (rat)

· **Primary irritant effect:**
· **on the skin:** No irritant effect.
· **on the eye:** No irritating effect.
· **Sensitization:** No sensitizing effects known.

(Contd. on page 6)

Safety Data Sheet
acc. to OSHA HCS

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· **Additional toxicological information:**

· **Carcinogenic categories**

· **IARC (International Agency for Research on Cancer)**
Substance is not listed.

· **NTP (National Toxicology Program)**
Substance is not listed.

· **OSHA-Ca (Occupational Safety & Health Administration)**
Substance is not listed.

12 Ecological information

· **Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **Persistence and degradability** No further relevant information available.
· **Behavior in environmental systems:**
· **Bioaccumulative potential** No further relevant information available.
· **Mobility in soil** No further relevant information available.
· **Additional ecological information:**
· **General notes:**
Water hazard class 3 (Self-assessment): extremely hazardous for water
Do not allow product to reach ground water, water course or sewage system, even in small quantities.
Danger to drinking water if even extremely small quantities leak into the ground.
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.
· **Other adverse effects** No further relevant information available.

13 Disposal considerations

· **Waste treatment methods**
· **Recommendation:**
Must not be disposed of together with household garbage. Do not allow product to reach sewage system.

· **Uncleaned packagings:**
· **Recommendation:** Disposal must be made according to official regulations.

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14 Transport information

· **UN-Number**	
· **DOT, IMDG, IATA**	UN2315
· **UN proper shipping name**	
· **DOT**	Polychlorinated biphenyls, liquid
· **IMDG**	POLYCHLORINATED BIPHENYLS, LIQUID, MARINE POLLUTANT
· **IATA**	POLYCHLORINATED BIPHENYLS, LIQUID

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Trade name: Aroclor 1248 (PCB 1248)

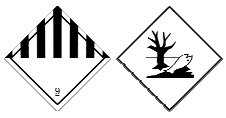
(Contd. of page 6)

· **Transport hazard class(es)**

· **DOT, IATA**

· **Class**	9 Miscellaneous dangerous substances and articles
· **Label**	9

· **IMDG**



· **Class**	9 Miscellaneous dangerous substances and articles
· **Label**	9
· **Packing group**	
· **DOT, IMDG, IATA**	II
· **Environmental hazards:**	Product contains environmentally hazardous substances: Aroclor 1016 (PCB 1016)
· **Marine pollutant:**	Symbol (fish and tree)
· **Special precautions for user**	Warning: Miscellaneous dangerous substances and articles
· **Danger code (Kemler):**	90
· **EMS Number:**	F-A,S-A
· **Stowage Category**	A
· **Segregation Code**	SG50 Segregation from foodstuffs as in 7.3.4.2.1, 7.6.3.1.2 or 7.7.3.6.
· **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **Transport/Additional information:**	
· **DOT**	
· **Quantity limitations**	On passenger aircraft/rail: 100 L On cargo aircraft only: 220 L
· **IMDG**	
· **Limited quantities (LQ)**	1L
· **Excepted quantities (EQ)**	Code: E2 Maximum net quantity per inner packaging: 30 ml Maximum net quantity per outer packaging: 500 ml
· **UN "Model Regulation":**	UN 2315 POLYCHLORINATED BIPHENYLS, LIQUID, 9, II, ENVIRONMENTALLY HAZARDOUS

(Contd. on page 8)

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15 Regulatory information

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **Sara**

· **Section 355 (extremely hazardous substances):**
Substance is not listed.

· **Section 313 (Specific toxic chemical listings):**
Substance is not listed.

· **TSCA (Toxic Substances Control Act):**
Substance is not listed.

· **TSCA new (21st Century Act): (Substances not listed)**

12672-29-6	Aroclor 1248 (PCB 1248)

· **Proposition 65**

· **Chemicals known to cause cancer:**
Substance is not listed.

· **Chemicals known to cause reproductive toxicity for females:**
Substance is not listed.

· **Chemicals known to cause reproductive toxicity for males:**
Substance is not listed.

· **Chemicals known to cause developmental toxicity:**
Substance is not listed.

· **Carcinogenic categories**

· **EPA (Environmental Protection Agency)**
Substance is not listed.

· **TLV (Threshold Limit Value established by ACGIH)**
Substance is not listed.

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**
Substance is not listed.

· **Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

16 Other information

The information contained in this document is based on Agilent's state of knowledge at the time of preparation. No warranty as to its accurateness, completeness or suitability for a particular purpose is expressed or implied.

· **Department issuing SDS:** Document Control / Regulatory
· **Contact:** regulatory@ultrasci.com
· **Date of preparation / last revision** 03/25/2019 / 2
· **Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)

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Safety Data Sheet
acc. to OSHA HCS

Printing date 03/25/2019 Version Number 3 Reviewed on 03/25/2019

Trade name: Aroclor 1248 (PCB 1248)

(Contd. of page 8)

NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
VOC: Volatile Organic Compounds (USA, EU)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bioaccumulative and Toxic
vPvB: very Persistent and very Bioaccumulative
NIOSH: National Institute for Occupational Safety
OSHA: Occupational Safety & Health
TLV: Threshold Limit Value
PEL: Permissible Exposure Limit
REL: Recommended Exposure Limit
STOT RE 2: Specific target organ toxicity (repeated exposure) – Category 2

· *** Data compared to the previous version altered.**

Safety Data Sheet
acc. to OSHA HCS

Printing date 03/25/2019 Version Number 2 Reviewed on 03/25/2019

*
1 Identification

· **Product identifier**

· **Trade name: Aroclor 1254 (PCB 1254)**

· **Part number:** RPC-1254, RPC-1254-1
· **CAS Number:**
11097-69-1
· **EC number:**
215-648-1
· **Index number:**
602-039-00-4
· **Application of the substance / the mixture** Reagents and Standards for Analytical Chemical Laboratory Use

· **Details of the supplier of the safety data sheet**
· **Manufacturer/Supplier:**
Agilent Technologies, Inc.
5301 Stevens Creek Blvd.
Santa Clara, CA 95051 USA

· **Information department:**
Telephone: 800-227-9770
e-mail: pdl-msds_author@agilent.com
· **Emergency telephone number:** CHEMTREC®: 1-800-424-9300

*
2 Hazard(s) identification

· **Classification of the substance or mixture**

GHS08 Health hazard

Carc. 1B H350 May cause cancer.

GHS07

Acute Tox. 4 H302 Harmful if swallowed.

· **Label elements**
· **GHS label elements** The substance is classified and labeled according to the Globally Harmonized System (GHS).
· **Hazard pictograms**


GHS07 GHS08

· **Signal word** Danger

· **Hazard-determining components of labeling:**
Aroclor 1254 (PCB 1254)
· **Hazard statements**
Harmful if swallowed.
May cause cancer.
· **Precautionary statements**
Obtain special instructions before use.

(Contd. on page 2)

Safety Data Sheet
acc. to OSHA HCS

Trade name: Aroclor 1254 (PCB 1254)

(Contd. of page 1)

Do not handle until all safety precautions have been read and understood.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Wear protective gloves/protective clothing/eye protection/face protection.
If swallowed: Call a poison center/doctor if you feel unwell.
Rinse mouth.
IF exposed or concerned: Get medical advice/attention.
Store locked up.
Dispose of contents/container in accordance with local/regional/national/international regulations.

· **Classification system:**
· **NFPA ratings (scale 0 - 4)**

Health = 1
Fire = 0
Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**

Health = *1
Fire = 0
Reactivity = 0

· **Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

3 Composition/information on ingredients

· **Chemical characterization: Substances**
· **CAS No. Description**
11097-69-1 Aroclor 1254 (PCB 1254)
· **Identification number(s)**
· **EC number:** 215-648-1
· **Index number:** 602-039-00-4

*
4 First-aid measures

· **Description of first aid measures**
· **General information:**
Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:** Generally the product does not irritate the skin.
· **After eye contact:** Rinse opened eye for several minutes under running water.
· **After swallowing:** Immediately call a doctor.
· **Information for doctor:**
· **Most important symptoms and effects, both acute and delayed** No further relevant information available.

(Contd. on page 3)

Safety Data Sheet
acc. to OSHA HCS

(Contd. of page 2)

· **Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

5 Fire-fighting measures

· **Extinguishing media**
· **Suitable extinguishing agents:** Use fire fighting measures that suit the environment.
· **Special hazards arising from the substance or mixture** No further relevant information available.
· **Advice for firefighters**
· **Protective equipment:** No special measures required.

6 Accidental release measures

· **Personal precautions, protective equipment and emergency procedures** Not required.
· **Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **Methods and material for containment and cleaning up:**
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Dispose contaminated material as waste according to item 13.
Ensure adequate ventilation.
· **Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.
· **Protective Action Criteria for Chemicals**

· **PAC-1:**
1.5 mg/m³
· **PAC-2:**
68 mg/m³
· **PAC-3:**
200 mg/m³

7 Handling and storage

· **Handling:**
· **Precautions for safe handling**
Ensure good ventilation/exhaustion at the workplace.
Open and handle receptacle with care.
· **Information about protection against explosions and fires:** Keep respiratory protective device available.

· **Conditions for safe storage, including any incompatibilities**
· **Storage:**
· **Requirements to be met by storerooms and receptacles:** No special requirements.
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:** Keep receptacle tightly sealed.
· **Specific end use(s)** No further relevant information available.

(Contd. on page 4)

Safety Data Sheet
acc. to OSHA HCS

(Contd. of page 3)

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8 Exposure controls/personal protection

· **Additional information about design of technical systems:** No further data; see item 7.

· **Control parameters**

· **Components with limit values that require monitoring at the workplace:**
The following constituent is the only constituent of the product which has a PEL, TLV or other recommended exposure limit.
The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit.
At this time, the remaining constituent has no known exposure limits.
At this time, the other constituents have no known exposure limits.

11097-69-1 Aroclor 1254 (PCB 1254)	
PEL	Long-term value: 0.5 mg/m³ Skin
REL	Long-term value: 0.001 mg/m³ See Pocket Guide App. A
TLV	Long-term value: 0.5 mg/m³ Skin

· **Additional information:** The lists that were valid during the creation were used as basis.

· **Exposure controls**

· **Personal protective equipment:**

· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Wash hands before breaks and at the end of work.
Store protective clothing separately.

· **Breathing equipment:**
When used as intended with Agilent instruments, the use of the product under normal laboratory conditions and with standard practices does not result in significant airborne exposures and therefore respiratory protection is not needed.
Under an emergency condition where a respirator is deemed necessary, use a NIOSH or equivalent approved device/equipment with appropriate organic or acid gas cartridge.

· **Protection of hands:**
Although not recommended for constant contact with the chemicals or for clean-up, nitrile gloves 11-13 mil thickness are recommended for normal use. The breakthrough time is 1 hr. For cleaning a spill where there is direct contact of the chemical, butyl rubber gloves are recommended 12-15 mil thickness with breakthrough times exceeding 4 hrs. Supplier recommendations should be followed.

· **Material of gloves**
For normal use: nitrile rubber, 11-13 mil thickness
For direct contact with the chemical: butyl rubber, 12-15 mil thickness
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.

· **Penetration time of glove material**
For normal use: nitrile rubber: 1 hour
For direct contact with the chemical: butyl rubber: >4 hours

(Contd. on page 5)

Safety Data Sheet
acc. to OSHA HCS

Trade name: Aroclor 1254 (PCB 1254)

(Contd. of page 4)

· **Eye protection:**

Tightly sealed goggles

*

9 Physical and chemical properties

· **Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Fluid
Color:	Not determined.
· **Odor:**	Characteristic
· **Odor threshold:**	Not determined.
· **pH-value:**	Not determined.
· **Change in condition**	
Melting point/Melting range:	Undetermined.
Boiling point/Boiling range:	Undetermined.
· **Flash point:**	Not applicable.
· **Flammability (solid, gaseous):**	Not applicable.
· **Decomposition temperature:**	Not determined.
· **Auto igniting:**	Not determined.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapor pressure:**	Not determined.
· **Density:**	Not determined.
· **Relative density**	Not determined.
· **Vapor density**	Not determined.
· **Evaporation rate**	Not determined.
· **Solubility in / Miscibility with**	
Water:	Not miscible or difficult to mix.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not determined.
Kinematic:	Not determined.
VOC content:	0.00 % 0.0 g/l / 0.00 lb/gal
· **Other information**	No further relevant information available.

(Contd. on page 6)

Safety Data Sheet
acc. to OSHA HCS

(Contd. of page 5)

10 Stability and reactivity

· **Reactivity** No further relevant information available.
· **Chemical stability**
· **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
· **Possibility of hazardous reactions** No dangerous reactions known.
· **Conditions to avoid** No further relevant information available.
· **Incompatible materials:** No further relevant information available.
· **Hazardous decomposition products:** No dangerous decomposition products known.

*
11 Toxicological information

· **Information on toxicological effects**
· **Acute toxicity:**

· **LD/LC50 values that are relevant for classification:**		
ATE (Acute Toxicity Estimate)		
Oral	LD50	1,010 mg/kg (rat)

11097-69-1 Aroclor 1254 (PCB 1254)		
Oral	LD50	1,010 mg/kg (rat)

· **Primary irritant effect:**
· **on the skin:** No irritant effect.
· **on the eye:** No irritating effect.
· **Sensitization:** No sensitizing effects known.
· **Additional toxicological information:**

· **Carcinogenic categories**

· **IARC (International Agency for Research on Cancer)**
2A

· **NTP (National Toxicology Program)**
R

· **OSHA-Ca (Occupational Safety & Health Administration)**
Substance is not listed.

12 Ecological information

· **Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **Persistence and degradability** No further relevant information available.
· **Behavior in environmental systems:**
· **Bioaccumulative potential** No further relevant information available.
· **Mobility in soil** No further relevant information available.
· **Additional ecological information:**
· **General notes:**
Water hazard class 1 (Self-assessment): slightly hazardous for water
Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.

(Contd. on page 7)

Safety Data Sheet
acc. to OSHA HCS

Trade name: Aroclor 1254 (PCB 1254)

(Contd. of page 6)

· **vPvB:** Not applicable.
· **Other adverse effects** No further relevant information available.

13 Disposal considerations

· **Waste treatment methods**
· **Recommendation:**
Must not be disposed of together with household garbage. Do not allow product to reach sewage system.

· **Uncleaned packagings:**
· **Recommendation:** Disposal must be made according to official regulations.

*
14 Transport information

· **UN-Number**	
· **DOT, IMDG, IATA**	UN2315
· **UN proper shipping name**	
· **DOT**	Polychlorinated biphenyls, liquid
· **IMDG**	POLYCHLORINATED BIPHENYLS, LIQUID, MARINE POLLUTANT
· **IATA**	POLYCHLORINATED BIPHENYLS, LIQUID
· **Transport hazard class(es)**	
· **DOT, IATA**	
· **Class**	9 Miscellaneous dangerous substances and articles
· **Label**	9
· **IMDG**	
· **Class**	9 Miscellaneous dangerous substances and articles
· **Label**	9
· **Packing group**	
· **DOT, IMDG, IATA**	II
· **Environmental hazards:**	
· **Marine pollutant:**	Symbol (fish and tree)
· **Special precautions for user**	Warning: Miscellaneous dangerous substances and articles
· **Danger code (Kemler):**	90
· **EMS Number:**	6.1-02
· **Stowage Category**	A

(Contd. on page 8)

(Contd. of page 7)

· **Segregation Code**	SG50 Segregation from foodstuffs as in 7.3.4.2.1, 7.6.3.1.2 or 7.7.3.6.
· **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **Transport/Additional information:**	
· **DOT**	
· **Quantity limitations**	On passenger aircraft/rail: 100 L On cargo aircraft only: 220 L
· **Hazardous substance:**	1 lbs, 0.454 kg
· **IMDG**	
· **Limited quantities (LQ)**	1L
· **Excepted quantities (EQ)**	Code: E2 Maximum net quantity per inner packaging: 30 ml Maximum net quantity per outer packaging: 500 ml
· **UN "Model Regulation":**	UN 2315 POLYCHLORINATED BIPHENYLS, LIQUID, 9, II

*

15 Regulatory information

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **Sara**

· **Section 355 (extremely hazardous substances):**
Substance is not listed.

· **Section 313 (Specific toxic chemical listings):**
Substance is not listed.

· **TSCA (Toxic Substances Control Act):**
Substance is not listed.

· **TSCA new (21st Century Act): (Substances not listed)**

11097-69-1	Aroclor 1254 (PCB 1254)

· **Proposition 65**

· **Chemicals known to cause cancer:**
Substance is not listed.

· **Chemicals known to cause reproductive toxicity for females:**
Substance is not listed.

· **Chemicals known to cause reproductive toxicity for males:**
Substance is not listed.

· **Chemicals known to cause developmental toxicity:**
Substance is not listed.

· **Carcinogenic categories**

· **EPA (Environmental Protection Agency)**

B2

(Contd. on page 9)

Safety Data Sheet
acc. to OSHA HCS

Trade name: Aroclor 1254 (PCB 1254)

(Contd. of page 8)

· **TLV (Threshold Limit Value established by ACGIH)**

A3

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**

Substance is listed.

· **National regulations:**

· **Information about limitation of use:**
Workers are not allowed to be exposed to this hazardous material. Exceptions can be made by the authorities in certain cases.
· **Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

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16 Other information

The information contained in this document is based on Agilent's state of knowledge at the time of preparation. No warranty as to its accurateness, completeness or suitability for a particular purpose is expressed or implied.

· **Department issuing SDS:** Document Control / Regulatory
· **Contact:** regulatory@ultrasci.com
· **Date of preparation / last revision** 03/25/2019 / 1
· **Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
VOC: Volatile Organic Compounds (USA, EU)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bioaccumulative and Toxic
vPvB: very Persistent and very Bioaccumulative
NIOSH: National Institute for Occupational Safety
OSHA: Occupational Safety & Health
TLV: Threshold Limit Value
PEL: Permissible Exposure Limit
REL: Recommended Exposure Limit
Acute Tox. 4: Acute toxicity – Category 4
Carc. 1B: Carcinogenicity – Category 1B
· *** Data compared to the previous version altered.**

Safety Data Sheet
acc. to OSHA HCS

Printing date 03/25/2019 Version Number 2 Reviewed on 03/25/2019

*
1 Identification

· **Product identifier**

· **Trade name: Aroclor 1260 (PCB 1260)**

· **Part number:** RPC-1260, RPC-1260-1
· **CAS Number:**
11096-82-5
· **EC number:**
215-648-1
· **Index number:**
602-039-00-4
· **Application of the substance / the mixture** Reagents and Standards for Analytical Chemical Laboratory Use

· **Details of the supplier of the safety data sheet**
· **Manufacturer/Supplier:**
Agilent Technologies, Inc.
5301 Stevens Creek Blvd.
Santa Clara, CA 95051 USA

· **Information department:**
Telephone: 800-227-9770
e-mail: pdl-msds_author@agilent.com
· **Emergency telephone number:** CHEMTREC®: 1-800-424-9300

*
2 Hazard(s) identification

· **Classification of the substance or mixture**


GHS08 Health hazard

Carc. 1A H350 May cause cancer.
STOT RE 2 H373 May cause damage to organs through prolonged or repeated exposure.


GHS07

Acute Tox. 4 H302 Harmful if swallowed.
Acute Tox. 4 H312 Harmful in contact with skin.

· **Label elements**
· **GHS label elements** The substance is classified and labeled according to the Globally Harmonized System (GHS).
· **Hazard pictograms**



GHS07 GHS08

· **Signal word** Danger

· **Hazard-determining components of labeling:**
aroclor 1260
· **Hazard statements**
Harmful if swallowed or in contact with skin.

(Contd. on page 2)

Safety Data Sheet
acc. to OSHA HCS

Trade name: Aroclor 1260 (PCB 1260)

(Contd. of page 1)

May cause cancer.
May cause damage to organs through prolonged or repeated exposure.

· **Precautionary statements**
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Do not breathe dust/fume/gas/mist/vapors/spray.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Wear protective gloves/protective clothing/eye protection/face protection.
If swallowed: Call a poison center/doctor if you feel unwell.
Rinse mouth.
If on skin: Wash with plenty of water.
IF exposed or concerned: Get medical advice/attention.
Specific treatment (see on this label).
Get medical advice/attention if you feel unwell.
Take off contaminated clothing and wash it before reuse.
Store locked up.
Dispose of contents/container in accordance with local/regional/national/international regulations.

· **Classification system:**
· **NFPA ratings (scale 0 - 4)**

Health = 1
Fire = 0
Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**

Health = *1
Fire = 0
Reactivity = 0

· **Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

3 Composition/information on ingredients

· **Chemical characterization: Substances**
· **CAS No. Description**
11096-82-5 aroclor 1260
· **Identification number(s)**
· **EC number:** 215-648-1
· **Index number:** 602-039-00-4

*
4 First-aid measures

· **Description of first aid measures**
· **General information:**
Immediately remove any clothing soiled by the product.

(Contd. on page 3)

Safety Data Sheet
acc. to OSHA HCS

Trade name: Aroclor 1260 (PCB 1260)

(Contd. of page 2)

Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:** Immediately rinse with water.
· **After eye contact:** Rinse opened eye for several minutes under running water.
· **After swallowing:** Immediately call a doctor.
· **Information for doctor:**
· **Most important symptoms and effects, both acute and delayed** No further relevant information available.
· **Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

5 Fire-fighting measures

· **Extinguishing media**
· **Suitable extinguishing agents:** Use fire fighting measures that suit the environment.
· **Special hazards arising from the substance or mixture**
During heating or in case of fire poisonous gases are produced.
· **Advice for firefighters**
· **Protective equipment:** Mouth respiratory protective device.

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6 Accidental release measures

· **Personal precautions, protective equipment and emergency procedures** Mount respiratory protective device.
· **Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **Methods and material for containment and cleaning up:**
Dispose contaminated material as waste according to item 13.
Ensure adequate ventilation.
· **Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.
· **Protective Action Criteria for Chemicals**

· **PAC-1:**
0.41 mg/m³

· **PAC-2:**
4.5 mg/m³

· **PAC-3:**
260 mg/m³

*
7 Handling and storage

· **Handling:**
· **Precautions for safe handling**
Ensure good ventilation/exhaustion at the workplace.
Open and handle receptacle with care.
· **Information about protection against explosions and fires:** Keep respiratory protective device available.

(Contd. on page 4)

Safety Data Sheet
acc. to OSHA HCS

Trade name: Aroclor 1260 (PCB 1260)

(Contd. of page 3)

· **Conditions for safe storage, including any incompatibilities**
· **Storage:**
· **Requirements to be met by storerooms and receptacles:** No special requirements.
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:** Keep receptacle tightly sealed.
· **Specific end use(s)** No further relevant information available.

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8 Exposure controls/personal protection

· **Additional information about design of technical systems:** No further data; see item 7.

· **Control parameters**
· **Components with limit values that require monitoring at the workplace:** Not required.
· **Additional information:** The lists that were valid during the creation were used as basis.

· **Exposure controls**
· **Personal protective equipment:**
· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing.
Wash hands before breaks and at the end of work.
Store protective clothing separately.
Avoid contact with the eyes and skin.
· **Breathing equipment:**
When used as intended with Agilent instruments, the use of the product under normal laboratory conditions and with standard practices does not result in significant airborne exposures and therefore respiratory protection is not needed.
Under an emergency condition where a respirator is deemed necessary, use a NIOSH or equivalent approved device/equipment with appropriate organic or acid gas cartridge.
· **Protection of hands:**
Although not recommended for constant contact with the chemicals or for clean-up, nitrile gloves 11-13 mil thickness are recommended for normal use. The breakthrough time is 1 hr. For cleaning a spill where there is direct contact of the chemical, butyl rubber gloves are recommended 12-15 mil thickness with breakthrough times exceeding 4 hrs. Supplier recommendations should be followed.
· **Material of gloves**
For normal use: nitrile rubber, 11-13 mil thickness
For direct contact with the chemical: butyl rubber, 12-15 mil thickness
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.
· **Penetration time of glove material**
For normal use: nitrile rubber: 1 hour
For direct contact with the chemical: butyl rubber: >4 hours
· **Eye protection:**

Tightly sealed goggles

(Contd. on page 5)

Safety Data Sheet
acc. to OSHA HCS

(Contd. of page 4)

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9 Physical and chemical properties

· **Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Solid
Color:	Light yellow
· **Odor:**	Characteristic
· **Odor threshold:**	Not determined.
· **pH-value:**	Not applicable.
· **Change in condition**	
Melting point/Melting range:	Undetermined.
Boiling point/Boiling range:	385 °C (725 °F)
· **Flash point:**	Not applicable.
· **Flammability (solid, gaseous):**	Product is not flammable.
· **Decomposition temperature:**	Not determined.
· **Auto igniting:**	Not determined.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapor pressure:**	Not applicable.
· **Density at 20 °C (68 °F):**	1.57 g/cm³ (13.10165 lbs/gal)
· **Relative density**	Not determined.
· **Vapor density**	Not applicable.
· **Evaporation rate**	Not applicable.
· **Solubility in / Miscibility with**	
Water:	Insoluble.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not applicable.
Kinematic:	Not applicable.
VOC content:	0.00 % 0.0 g/l / 0.00 lb/gal
· **Other information**	No further relevant information available.

10 Stability and reactivity

· **Reactivity** No further relevant information available.
· **Chemical stability**
· **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
· **Possibility of hazardous reactions** No dangerous reactions known.
· **Conditions to avoid** No further relevant information available.
· **Incompatible materials:** No further relevant information available.

(Contd. on page 6)

Safety Data Sheet
acc. to OSHA HCS

(Contd. of page 5)

· **Hazardous decomposition products:** No dangerous decomposition products known.

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11 Toxicological information

· **Information on toxicological effects**
· **Acute toxicity:**

· **LD/LC50 values that are relevant for classification:**		
ATE (Acute Toxicity Estimate)		
Oral	LD50	1,315 mg/kg (rat)
Dermal	LD50	1,100 mg/kg

11096-82-5 aroclor 1260		
Oral	LD50	1,315 mg/kg (rat)

· **Primary irritant effect:**
· **on the skin:** No irritant effect.
· **on the eye:** No irritating effect.
· **Sensitization:** No sensitizing effects known.
· **Additional toxicological information:**

· **Carcinogenic categories**

· **IARC (International Agency for Research on Cancer)**
Substance is not listed.

· **NTP (National Toxicology Program)**
R

· **OSHA-Ca (Occupational Safety & Health Administration)**
Substance is not listed.

12 Ecological information

· **Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **Persistence and degradability** No further relevant information available.
· **Behavior in environmental systems:**
· **Bioaccumulative potential** No further relevant information available.
· **Mobility in soil** No further relevant information available.
· **Additional ecological information:**
· **General notes:**
Water hazard class 3 (Self-assessment): extremely hazardous for water
Do not allow product to reach ground water, water course or sewage system, even in small quantities.
Danger to drinking water if even extremely small quantities leak into the ground.
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.
· **Other adverse effects** No further relevant information available.

(Contd. on page 7)

Safety Data Sheet
acc. to OSHA HCS

Trade name: Aroclor 1260 (PCB 1260)

(Contd. of page 6)

13 Disposal considerations

· **Waste treatment methods**
· **Recommendation:**
Must not be disposed of together with household garbage. Do not allow product to reach sewage system.

· **Uncleaned packagings:**
· **Recommendation:** Disposal must be made according to official regulations.

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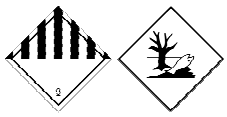
14 Transport information

· **UN-Number**	
· **DOT, IMDG, IATA**	UN3432
· **UN proper shipping name**	
· **DOT**	Polychlorinated biphenyls, solid
· **IMDG**	POLYCHLORINATED BIPHENYLS, SOLID, MARINE POLLUTANT
· **IATA**	POLYCHLORINATED BIPHENYLS, SOLID
· **Transport hazard class(es)**	
· **DOT, IMDG**	
· **Class**	9 Miscellaneous dangerous substances and articles
· **Label**	9
· **IATA**	
· **Class**	9 Miscellaneous dangerous substances and articles
· **Label**	9
· **Packing group**	
· **DOT, IMDG, IATA**	II
· **Environmental hazards:**	
· **Marine pollutant:**	Yes (DOT) Symbol (fish and tree)
· **Special precautions for user**	Warning: Miscellaneous dangerous substances and articles
· **Danger code (Kemler):**	90
· **EMS Number:**	F-A,S-A
· **Stowage Category**	A
· **Segregation Code**	SG50 Segregation from foodstuffs as in 7.3.4.2.1, 7.6.3.1.2 or 7.7.3.6.

(Contd. on page 8)

(Contd. of page 7)

· **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **Transport/Additional information:**	
· **DOT**	
· **Quantity limitations**	On passenger aircraft/rail: 100 kg On cargo aircraft only: 200 kg
· **Remarks:**	Special marking with the symbol (fish and tree).
· **IMDG**	
· **Limited quantities (LQ)**	1 kg
· **Excepted quantities (EQ)**	Code: E2 Maximum net quantity per inner packaging: 30 g Maximum net quantity per outer packaging: 500 g
· **UN "Model Regulation":**	UN 3432 POLYCHLORINATED BIPHENYLS, SOLID, 9, II, ENVIRONMENTALLY HAZARDOUS

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15 Regulatory information

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **Sara**

· **Section 355 (extremely hazardous substances):**
Substance is not listed.

· **Section 313 (Specific toxic chemical listings):**
Substance is not listed.

· **TSCA (Toxic Substances Control Act):**
Substance is not listed.

· **TSCA new (21st Century Act): (Substances not listed)**

11096-82-5	aroclor 1260

· **Proposition 65**

· **Chemicals known to cause cancer:**
Substance is listed.

· **Chemicals known to cause reproductive toxicity for females:**
Substance is not listed.

· **Chemicals known to cause reproductive toxicity for males:**
Substance is not listed.

· **Chemicals known to cause developmental toxicity:**
Substance is not listed.

· **Carcinogenic categories**

· **EPA (Environmental Protection Agency)**
Substance is not listed.

· **TLV (Threshold Limit Value established by ACGIH)**
Substance is not listed.

(Contd. on page 9)

Safety Data Sheet
acc. to OSHA HCS

Trade name: Aroclor 1260 (PCB 1260)

(Contd. of page 8)

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**

Substance is not listed.

· **National regulations:**

· **Additional classification according to Decree on Hazardous Materials:**
Carcinogenic hazardous material group I (extremely dangerous).
Carcinogenic hazardous material group II (very dangerous).
Carcinogenic hazardous material group III (dangerous).

· **Information about limitation of use:**
Workers are not allowed to be exposed to this hazardous material. Exceptions can be made by the authorities in certain cases.

· **Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

16 Other information

The information contained in this document is based on Agilent's state of knowledge at the time of preparation. No warranty as to its accurateness, completeness or suitability for a particular purpose is expressed or implied.

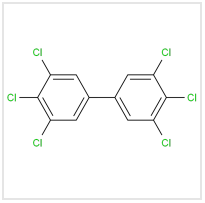
· **Department issuing SDS:** Document Control / Regulatory

· **Contact:** regulatory@ultrasci.com

· **Date of preparation / last revision** 03/25/2019 / 1

· **Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
VOC: Volatile Organic Compounds (USA, EU)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bioaccumulative and Toxic
vPvB: very Persistent and very Bioaccumulative
NIOSH: National Institute for Occupational Safety
OSHA: Occupational Safety & Health
TLV: Threshold Limit Value
PEL: Permissible Exposure Limit
REL: Recommended Exposure Limit
Acute Tox. 4: Acute toxicity – Category 4
Carc. 1A: Carcinogenicity – Category 1A
STOT RE 2: Specific target organ toxicity (repeated exposure) – Category 2

· *** Data compared to the previous version altered.**



1,1'-Biphenyl,chloro derivs. (CAS No. 1336-36-3) SDS

CAS No: 1336-36-3 **Molecular Weight:** 360.87816 **Molecular Formula:** $C^{12}H^4CL^6$

Names and Identifiers | Properties | Safety and Handling | Computational chemical data | 12 Suppliers

SDS

SAFETY DATA SHEETS

According to Globally Harmonized System of Classification and Labelling of Chemicals (GHS) - Sixth revised edition

Version: 1.0
Creation Date: Aug 17, 2017
Revision Date: Aug 17, 2017

1. Identification

1.1 GHS Product identifier

Product name CLOPHEN A 30 : A 60 1 : 1

1.2 Other means of identification

Product number -
Other names -

1.3 Recommended use of the chemical and restrictions on use

Identified uses For industry use only. Dioxins, Furans, PCBs (contain phenyl rings of carbon atoms), Pesticides (chemicals used for killing pests, such as rodents, insects, or plants)
Uses advised against no data available

1.4 Supplier's details

Company XiXisys.com
Address XiXisys.com
Telephone XiXisys.com
Fax XiXisys.com

1.5 Emergency phone number

Emergency phone number -
Service hours Monday to Friday, 9am-5pm (Standard time zone: UTC/GMT +8 hours).

2. Hazard identification

2.1 Classification of the substance or mixture

Specific target organ toxicity \u2013 repeated exposure, Category 2
Hazardous to the aquatic environment, short-term (Acute) - Category Acute 1
Hazardous to the aquatic environment, long-term (Chronic) - Category Chronic 1

2.2 GHS label elements, including precautionary statements

Pictogram(s)

Signal word Warning
Hazard statement(s) H373 May cause damage to organs through prolonged or repeated exposure
H410 Very toxic to aquatic life with long lasting effects

Precautionary statement(s)
Prevention P260 Do not breathe dust/fume/gas/mist/vapours/spray.
P273 Avoid release to the environment.
Response P314 Get medical advice/attention if you feel unwell.
P391 Collect spillage.
Storage none
Disposal P501 Dispose of contents/container to ...

2.3 Other hazards which do not result in classification

none

3. Composition/information on ingredients

3.1 Substances

Chemical name	Common names and synonyms	CAS number	EC number	Concentration
CLOPHEN A 30 : A 60 1 : 1	CLOPHEN A 30 : A 60 1 : 1	1336-36-3	none	100%

4. First-aid measures

4.1 Description of necessary first-aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms/effects, acute and delayed

no data available

4.3 Indication of immediate medical attention and special treatment needed, if necessary

If PCB-containing substances have been ingested recently, gastric decontamination may be reasonable. Activated charcoal has not been proven beneficial, but is not contraindicated.

5. Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media

Use dry chemical, carbon dioxide, or alcohol foam extinguishers. Vapors are heavier than air and will collect in low areas. Vapors in confined areas may explode when exposed to fire. Containers may explode in fire. Storage containers and parts of containers may rocket great distances, in many directions. If material or contaminated runoff enters waterways, notify downstream users of potentially contaminated waters. Notify local health and fire officials and pollution control agencies. From a secure, explosion-proof location, use water spray to cool exposed containers. If cooling streams are ineffective (venting sound increases in volume and pitch, tank discolors, or shows any signs of deforming), withdraw immediately to a secure position ... The only respirators recommended for fire fighting are self-contained breathing apparatuses that have full facepieces and are operated in a pressure-demand or other positive pressure mode.

5.2 Specific hazards arising from the chemical

no data available

5.3 Special protective actions for fire-fighters

Wear self-contained breathing apparatus for firefighting if necessary.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up

... Dry sand or earth should be spread on the leak, or spill area. ...

7. Handling and storage

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Avoid exposure - obtain special instructions before use.Provide appropriate exhaust ventilation at places where dust is formed. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

PCB material should be stored in closed containers, in ventilated areas ... PCB's should be handled in isolated areas of the plant, where efficient ventilation systems remove airborne PCB's. ...

8. Exposure controls/personal protection

8.1 Control parameters

Occupational Exposure limit values

HALOWAX 1013

Cambridge Isotope Laboratories, Inc.

Formula:C12H4Cl6

Einecs:215-648-1

NIOSH considers chlorodiphenyl containing 54% chlorine to be a potential occupational carcinogen. /Aroclor 1254/

NIOSH usually recommends that occupational exposures to carcinogens be limited to the lowest feasible concn. /Aroclor 1254/

Recommended Exposure Limit: 10 Hr Time-Weighted Avg: 0.001 mg/cu m. /Aroclor 1254/

NIOSH considers chlorodiphenyl containing 54% chlorine to be a potential occupational carcinogen. /Aroclor 1254/

NIOSH usually recommends that occupational exposures to carcinogens be limited to the lowest feasible concentration. /Aroclor 1254/

Recommended Exposure Limit: 10 Hour Time-Weighted Average: 0.001 mg/cu m. /Aroclor 1254/

Biological limit values

no data available

8.2 Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

8.3 Individual protection measures, such as personal protective equipment (PPE)

Eye/face protection

Safety glasses with side-shields conforming to EN166. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Wear impervious clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace. Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique(without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Respiratory protection

Wear dust mask when handling large quantities.

Thermal hazards

no data available

9. Physical and chemical properties

Physical state	no data available
Colour	Vary from mobile oily liquids to white crystalline solids and hard noncrystalline resins.
Odour	Practically odorless; mild aromatic odor
Melting point/ freezing point	no data available
Boiling point or initial boiling point and boiling range	340\uff5e375
Flammability	no data available
Lower and upper explosion limit / flammability limit	no data available
Flash point	195(O.C)
Auto-ignition temperature	no data available
Decomposition temperature	no data available
pH	no data available
Kinematic viscosity	no data available
Solubility	Solubility in water is extremely low; soluble in oils and organic solvents.
Partition coefficient n-octanol/water (log value)	... literature Kow values will vary. These increase with increasing chlorination. log Kow values at 25\u00b0C: 3.76 (biphenyl); 5.7 (Cl4-PCB's); 6.0 (Cl5-PCB's); 7.0 (Cl6-PCB's); 8.26 (Cl10-PCB's).
Vapour pressure	2.04E-07mmHg at 25\u00b0C
Density and/or relative density	1.44(30\u00baC)
Relative vapour density	no data available
Particle characteristics	no data available

10. Stability and reactivity

10.1 Reactivity

no data available

10.2 Chemical stability

... PCB's are chemically very inert and are stable to conditions of hydrolysis and oxidation in industrial use. Photochemical degradation may be one route of their breakdown in the environment. ...

10.3 Possibility of hazardous reactions

Flame resistant.

10.4 Conditions to avoid

no data available

10.5 Incompatible materials

Liquid chlorine reacts exothermically with polychlorinated biphenyl heat transfer liquid. /Polychlorinated biphenyl/

10.6 Hazardous decomposition products

When heated to decomposition it emits toxic fumes of Chloride.

11. Toxicological information

Acute toxicity

Oral: LD50 Mouse (C57B1/6J) male oral 19 mg/kg/28 day

Inhalation: no data available

Dermal: no data available

Skin corrosion/irritation

no data available

Serious eye damage/irritation

no data available

Respiratory or skin sensitization

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

EPA: Possibly carcinogenic to humans, IARC: Probably carcinogenic to humans, NTP: Known to be a human carcinogen

Reproductive toxicity

An epidemiological study of women occupationally exposed to high levels of PCBs suggested a relationship between PCB exposure and reduced birth weight and shortened gestational age of their babies; however, limitations of the study limit the strength of the conclusion. Two series of human studies that investigated exposure to PCBs through the consumption of contaminated fish suggest that exposure to PCBs may cause developmental effects in humans. Both studies reported an association between consumption of fish with high PCB levels by pregnant women and an increased incidence of neurodevelopmental effects, such as motor deficits at birth, impaired psychomotor index, impaired visual recognition, and deficits in short-term memory in infants. Human studies are not conclusive on the reproductive effects of PCBs. One study of men who were occupationally exposed to PCBs showed no fertility abnormalities, while another study of men with low sperm counts found elevated levels of PCBs in the blood and an association between certain PCB compounds in semen and decreased sperm motility. Animal studies have reported developmental effects, such as learning deficits, impaired immune functions, focal liver necrosis, and cellular alterations of the thyroid, in the offspring of animals exposed orally to PCBs. Reproductive effects, such as decreased fertility, decreased conception, and prolonged menstruation have also been noted in animal studies of dietary PCB exposures.

STOT-single exposure

no data available

STOT-repeated exposure

no data available

Aspiration hazard

no data available

12. Ecological information

12.1 Toxicity

Toxicity to fish: no data available

Toxicity to daphnia and other aquatic invertebrates: no data available

Toxicity to algae: EC50; Species: Pseudokirchneriella subcapitata (green algae); Conditions: freshwater, static, 22\u00b0C; Concentration: 18

2 nmol/L for 48 hr; Effect: decreased population biomass />98% pure

Toxicity to microorganisms: no data available

12.2 Persistence and degradability

AEROBIC: The microbial mineralization of three chlorophenols and a PCB mixture was studied using natural bacterial assemblages in laboratory model systems. The systems consisted of water and surface sediment from two lake types: one with a high content of humic substances and the other with a low content. Final PCB concentration in the model systems was 38 ug/L. Aerobic mineralization of the (14)C-ring-labelled compounds was determined as production of (14)CO2 in the systems over the course of 60 days. Mineralization of PCBs in the systems was low compared to the aromatics. The breakdown of PCB was 0.047 nM in the humic cultures and 0.052 nM in cultures from the clear water lake. The avg mineralization rates of PCBs over the 60 day test period for the clear-water and humic cultures were 1.1 and 1.2 pM/day. More than 90% of the PCBs adsorbed to the sediment, while <1% was found in the water phase.

12.3 Bioaccumulative potential

Polychlorinated biphenyls (PCBs) are highly lipophilic and bioconcentrate in tissue from concentrations in water ...

12.4 Mobility in soil

PCB mobility in aqueous soil-sediment systems has reported experimental Koc values ranging from 510 to 13,300,000 for a variety of Aroclors and PCB congeners; reported Koc values were mostly above 5000(1). Reviews of the PCB mobility literature have found that adsorption of PCBs to soil and sediment generally increases with an increase in the degree of chlorination(2,3). Organic solvents, found at hazardous waste sites, will also increase the solubility and mobility of PCBs(3). Using soil TLC, column leaching and five different soils, PCBs were found to be generally immobile when leached with water or aqueous landfill leachate, but highly mobile when leached with organic solvents(4). PCB fluids can penetrate and travel through the cracks and other connected void spaces found in soil formations(5). In the presence of organic material dissolved from soil, the water solubility of PCBs increases which may augment its leachability. Environmental releases of PCBs often accompany releases of carrier materials from utility equipment. The PCBs that are present in the mineral oil-PCB mixture become even less water soluble than before. This is due to the PCB partitioning into the mineral oil and the reduced interaction of the PCBs with precipitation or groundwater caused by the hydrophobic nature of the oil matrix. The volatility of PCBs also affects their migration through the soil profile. Researchers have carried out simulations that indicate that PCBs can volatilize beneath the soil surface and potentially migrate through several meters of soil cover(5).

12.5 Other adverse effects

no data available

13. Disposal considerations

13.1 Disposal methods

Product

The material can be disposed of by removal to a licensed chemical destruction plant or by controlled incineration with flue gas scrubbing. Do not contaminate water, foodstuffs, feed or seed by storage or disposal. Do not discharge to sewer systems.

Contaminated packaging

Containers can be triply rinsed (or equivalent) and offered for recycling or reconditioning. Alternatively, the packaging can be punctured to make it unusable for other purposes and then be disposed of in a sanitary landfill. Controlled incineration with flue gas scrubbing is possible for combustible packaging materials.

14. Transport information

14.1 UN Number

ADR/RID: UN2315 IMDG: UN2315 IATA: UN2315

14.2 UN Proper Shipping Name

ADR/RID: POLYCHLORINATED BIPHENYLS, LIQUID
IMDG: POLYCHLORINATED BIPHENYLS, LIQUID
IATA: POLYCHLORINATED BIPHENYLS, LIQUID

14.3 Transport hazard class(es)

ADR/RID: unknown IMDG: unknown IATA: unknown

14.4 Packing group, if applicable

ADR/RID: II IMDG: II IATA: II

14.5 Environmental hazards

ADR/RID: yes IMDG: yes IATA: yes

14.6 Special precautions for user

no data available

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

no data available

15. Regulatory information

15.1 Safety, health and environmental regulations specific for the product in question

Chemical name	Common names and synonyms	CAS number	EC number
CLOPHEN A 30 : A 60 1 : 1	CLOPHEN A 30 : A 60 1 : 1	1336-36-3	none
European Inventory of Existing Commercial Chemical Substances (EINECS)			Listed.
EC Inventory			Listed.
United States Toxic Substances Control Act (TSCA) Inventory			Listed.
China Catalog of Hazardous chemicals 2015			Not Listed.
New Zealand Inventory of Chemicals (NZIoC)			Not Listed.
Philippines Inventory of Chemicals and Chemical Substances (PICCS)			Listed.
Vietnam National Chemical Inventory			Not Listed.
Chinese Chemical Inventory of Existing Chemical Substances (China IECSC)			Listed.

16. Other information

Information on revision

Creation Date Aug 17, 2017
Revision Date Aug 17, 2017

Abbreviations and acronyms

CAS: Chemical Abstracts Service

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road

RID: Regulation concerning the International Carriage of Dangerous Goods by Rail

IMDG: International Maritime Dangerous Goods

IATA: International Air Transportation Association

TWA: Time Weighted Average

STEL: Short term exposure limit

LC50: Lethal Concentration 50%

LD50: Lethal Dose 50%

EC50: Effective Concentration 50%

References

IPCS - The International Chemical Safety Cards (ICSC), website: http://www.ilo.org/dyn/icsc/showcard.home

HSDB - Hazardous Substances Data Bank, website: https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm

IARC - International Agency for Research on Cancer, website: http://www.iarc.fr/

eChemPortal - The Global Portal to Information on Chemical Substances by OECD, website: http://www.echemportal.org/echemportal/index?pageID=0&request_locale=en

CAMEO Chemicals, website: http://cameochemicals.noaa.gov/search/simple

ChemIDplus, website: http://chem.sis.nlm.nih.gov/chemidplus/chemidlite.jsp

ERG - Emergency Response Guidebook by U.S. Department of Transportation, website: http://www.phmsa.dot.gov/hazmat/library/erg

Germany GESTIS-database on hazard substance, website: http://www.dguv.de/ifa/gestis/gestis-stoffdatenbank/index-2.jsp

ECHA - European Chemicals Agency, website: https://echa.europa.eu/

Related Products' MSDS

cas:2051-60-7 msds

2-chlorobiphenyl

cas:952-04-5 msds

B-8539

cas:5002-13-1 msds

Ethanone,1-(3'-chloro[1,1'-biphenyl]-4-yl)-

cas:179526-95-5 msds

2'-BROMO-4-CHLORO-BIPHENYL

cas:6242-97-3 msds

1,1'-Biphenyl,4-chloro-4'-nitro-

cas:3808-89-7 msds

1-(2'-CHLORO-BIPHENYL-4-YL)-ETHANONE

cas:60200-91-1 msds

HCHAMYGZDLHKMD-UHFFFAOYSA-N

cas:17465-36-0 msds

1-Chloro-2-(cyclohex-1-EN-1-YL)benzene

cas:1261981-60-5 msds

B-7014

cas:97338-01-7 msds

1,1'-Biphenyl,4-[3-bromo-1-(4-bromophenyl)-1-

TCI AMERICA

SAFETY DATA SHEET

Revision number: 2
Revision date: 10/06/2014

1. IDENTIFICATION

Product name: 2,2-Bis(4-chlorophenyl)-1,1-dichloroethane
Product code: B0132

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborgate Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:
Acute Toxicity - Oral [Category 3]
Acute Toxicity - Dermal [Category 4]
Carcinogenicity [Category 2]
Aquatic Hazard (Acute) [Category 1]
Aquatic Hazard (Long-Term) [Category 1]

Signal word: Danger!

Hazard Statement(s):
Harmful in contact with skin
Suspected of causing cancer
Toxic if swallowed
Very toxic to aquatic life
Very toxic to aquatic life with long lasting effects

Pictogram(s) or Symbol(s):

Precautionary Statement(s):

[Prevention] Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Wear protective gloves and protective clothing. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves, protective clothing, eye protection and face protection.

[Response] If swallowed: Immediately call a poison center or doctor. Rinse mouth. If on skin: Wash with plenty of water. Call a poison center or doctor if you feel unwell. Take off contaminated clothing and wash it before reuse. If exposed or concerned: Get medical advice or attention.

[Storage] Store locked up.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance
Components: 2,2-Bis(4-chlorophenyl)-1,1-dichloroethane
Percent: >98.0%(GC)
CAS Number: 72-54-8
Molecular Weight: 320.03
Chemical Formula: $C_{14}H_{10}Cl_4$
Synonyms: p,p'-DDD , 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethane

4. FIRST-AID MEASURES

Inhalation: Immediately call a poison center or doctor. Effects of exposure (inhalation) to substance may be delayed. Inhalation of vapors or contact with substance will result in contamination and potential harmful effects. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact: Immediately call a poison center or doctor. Effects of exposure (skin contact) to substance may be delayed. Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Eye contact: If this chemical contacts the eyes, immediately wash (irrigate) the eyes with large amounts of water, occasionally lifting the lower and upper eyelids. If eye irritation persists get medical advice/attention. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Toxic if swallowed. Effects of exposure (ingestion) to substance may be delayed. Call a physician or Poison Control Center immediately. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: No data available
Delayed: Possibly carcinogenic to humans.

Immediate medical attention: WARNING: It might be dangerous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is toxic. CAUTION: Victim may be a source of contamination. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO_2 or water spray. Consult with local fire authorities before attempting large scale fire fighting operations.

Specific hazards arising from the chemical
Hazardous combustion products: These products include: Carbon oxides Halogenated compounds
Other specific hazards: WARNING: Highly toxic HCl gas is produced during combustion.

Special precautions for fire-fighters:
Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.
Special protective equipment for fire-fighters:
Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

6. ACCIDENTAL RELEASE MEASURES

Personal protective equipment: Splash goggles. Wear protective clothing (chemical resistant suit and chemical resistant boots). Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

Emergency procedures: Prevent dust cloud. Do not clean-up or dispose except under supervision of a specialist. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:
ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material. Ventilate the area.

Environmental precautions:
Keep away from living quarters. Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid inhalation of vapor or mist. Manipulate under an adequate fume hood. Do not ingest. Avoid contact with skin and eyes. Avoid contact with skin. Avoid exposure - obtain special instructions before use. Avoid prolonged or repeated exposure. Normal measures for preventive fire protection. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Store locked up. Keep containers tightly closed in a cool, well-ventilated place. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Combustible substances, Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

Appropriate engineering controls:
Handle only in a fully enclosed system and equipment. Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection: Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection: Nitrile gloves.
Eye protection: Safety glasses.
Skin and body protection: Lab coat.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Solid
Form: Crystal - Powder
Color: White - Almost white
Odor: No data available
Odor threshold: No data available

Melting point/freezing point:	111°C (232°F)	**pH:**	No data available
Boiling point/range:	No data available	**Vapor pressure:**	No data available
Decomposition temperature:	No data available	**Vapor density:**	11
Relative density:	No data available	**Dynamic Viscosity:**	No data available
Kinematic Viscosity:	No data available		
Partition coefficient: n-octanol/water (log P_{ow})	No data available	**Evaporation rate:** (Butyl Acetate = 1)	No data available
Flash point:	No data available	**Autoignition temperature:**	No data available
Flammability (solid, gas):	No data available	**Flammability or explosive limits:**	
		Lower:	No data available
		Upper:	No data available

Solubility(ies):
Water: Insoluble

9. PHYSICAL AND CHEMICAL PROPERTIES

Soluble: Hot methanol

10. STABILITY AND REACTIVITY

Reactivity: Not Available.
Chemical Stability: Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions: No hazardous reactivity has been reported.
Conditions to avoid: Avoid excessive heat and light.
Incompatible materials: Oxidizing agents
Hazardous Decomposition Products: No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: KI0700000

Acute Toxicity:
orl-rat LD50:113 mg/kg

skn-rbt LD50:1200 mg/kg

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
mtr-mus-emb 28400 nmol/L

hma-mus-srm 1500 mg/kg

cyt-rat-oth 10 ug/L

Carcinogenicity:

No data available

IARC: No data available **NTP:** No data available **OSHA:** No data available

Reproductive toxicity:
No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.
Symptoms related to exposure:
Overexposure may result in serious illness or death.
Potential Health Effects:
No specific information available; skin and eye contact may result in irriatation. May be harmful if inhaled or ingested.
Target organ(s): No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity

Fish: No data available
Crustacea: No data available
Algae: No data available

Persistence and degradability: No data available
Bioaccumulative potential (BCF): No data available
Mobillity in soil: No data available
Partition coefficient: No data available
n-octanol/water (log P_{ow})
Soil adsorption (Koc): No data available
Henry's Law: No data available
constant (PaM^3/mol)

13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.

Disposal of container: Dispose of as unused product. Do not re-use empty containers.

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2811	Toxic solids, organic, n.o.s.	6.1 Toxic material.	III

IATA

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2811	Toxic solid, oxidizing, n.o.s.	6.1 Toxic material.	III

IMDG

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN2811	Toxic solid, organic, n.o.s.	6.1 Toxic material.	III

EmS number: F-A, S-A

Reportable Quantitiy: 1 Pound (0.454 Kilograms)

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):
This product is NOT on the EPA Toxic Substances Control Act (TSCA) inventory. The following notices are required by 40 CFR 720.36 (C) for those products not on the inventory list:
(i) These products are supplied solely for use in research and development by or under the supervision of a technically qualified individual as defined in 40 CFR 720.0 et sec.
(ii) The health risks of these products have not been fully determined. Any information that is or becomes available will be supplied on a SDS sheet.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313: Not Listed

SARA 302: Not Listed

State Regulations

State Right-to-Know

Massachusetts Not Listed

New Jersey Listed

Pennsylvania Not Listed

California Proposition 65: Listed

Other Information

NFPA Rating:

Health: 2
Flammability: 0
Instability: 0

HMIS Classification:

Health: 2
Flammability: 0
Physical: 0

International Inventories

WHMIS hazard class: D1B: Materials causing immediate and serious toxic effects. (Toxic)
D2A: Materials causing other toxic effects. (Very Toxic)
D2B: Materials causing other toxic effects. (Toxic)

EC-No: 200-783-0

16. OTHER INFORMATION

16. OTHER INFORMATION

Revision date: 10/06/2014
Revision number: 2

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

TCI AMERICA

SAFETY DATA SHEET

Revision number: 3
Revision date: 08/15/2016

1. IDENTIFICATION

Product name: 2,2-Bis(4-chlorophenyl)-1,1-dichloroethylene
Product code: B0133

Product use: For laboratory research purposes.
Restrictions on use: Not for drug or household use.

Company:
TCI America
9211 N. Harborgate Street
Portland, OR 97203 U.S.A.
Telephone:
+1-800-423-8616 / +1-503-283-1681
Fax:
+1-888-520-1075 / +1-503-283-1987
e-mail:
sales-US@TCIchemicals.com
www.TCIchemicals.com

Emergency telephone number:
Chemical Emergencies:
TCI America (8:00am - 5:00pm) PST
+1-503-286-7624
Transportation Emergencies:
Chemtrec 24-Hour
+1-800-424-9300 (U.S.A.)
+1-703-527-3887 (International)
Responsible department:
TCI America
Environmental Health Safety and Security
+1- 503-286-7624

2. HAZARD(S) IDENTIFICATION

OSHA Haz Com: CFR 1910.1200:
Acute Toxicity - Oral [Category 4]
Carcinogenicity [Category 1B]
Aquatic Hazard (Acute) [Category 1]
Aquatic Hazard (Long-Term) [Category 1]

Signal word: Danger!

Hazard Statement(s):
Harmful if swallowed
May cause cancer
Very toxic to aquatic life
Very toxic to aquatic life with long lasting effects

Pictogram(s) or Symbol(s):

Precautionary Statement(s):

[Prevention] Do not eat, drink or smoke when using this product. Wash hands and face thoroughly after handling. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves, protective clothing, eye protection and face protection.

[Response] If swallowed: Immediately call a poison center or doctor. Rinse mouth. If exposed or concerned: Get medical advice or attention.

[Storage] Store locked up.

[Disposal] Dispose of contents and container in accordance with US EPA guidelines for the classification and determination of hazardous waste listed in 40 CFR 261.3. (See Section 13)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Substance
Components: 2,2-Bis(4-chlorophenyl)-1,1-dichloroethylene

3. COMPOSITION/INFORMATION ON INGREDIENTS

Percent: >99.0%(GC)
CAS Number: 72-55-9
Molecular Weight: 318.02
Chemical Formula: $C_{14}H_8Cl_4$

4. FIRST-AID MEASURES

Inhalation: Call emergency medical service. Effects of exposure (inhalation) to substance may be delayed. Inhalation of vapors or contact with substance will result in contamination and potential harmful effects. Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Skin contact: Call a poison center or doctor if you feel unwell. Effects of exposure (skin contact) to substance may be delayed. Remove and wash contaminated clothing before re-use. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Eye contact: If this chemical contacts the eyes, immediately wash (irrigate) the eyes with large amounts of water, occasionally lifting the lower and upper eyelids. If eye irritation persists get medical advice/attention. Move victim to fresh air. Check for and remove any contact lenses. Keep victim warm and quiet. Treat symptomatically and supportively. Effects of exposure to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Ingestion: Harmful if swallowed. Effects of exposure (ingestion) to substance may be delayed. If swallowed, seek medical advice immediately and show the container or label. Do not use mouth-to-mouth method if victim ingested the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Loosen tight clothing such as a collar, tie, belt or waistband. If a person vomits place them in the recovery position so that vomit will not reenter the mouth and throat. Rinse mouth. Keep victim warm and quiet. Treat symptomatically and supportively. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Symptoms/effects:

Acute: No data available
Delayed: No data available

Immediate medical attention: WARNING: It might be hazardous to the person providing aid to give mouth-to-mouth respiration, because the inhaled material is harmful. CAUTION: Victim may be a source of contamination. If breathing has stopped, perform artificial respiration. Use first aid treatment according to the nature of the injury. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Dry chemical, CO_2 , water spray, or alcohol-resistant foam. Consult with local fire authorities before attempting large scale fire fighting operations.

Specific hazards arising from the chemical
Hazardous combustion products: These products include: Carbon oxides Halogenated compounds
Other specific hazards: WARNING: Highly toxic HCl gas is produced during combustion.

Special precautions for fire-fighters:
Use water spray or fog; do not use straight streams. Dike fire-control water for later disposal; do not scatter the material. Containers may explode when heated. Move containers from fire area if you can do it without risk.
Special protective equipment for fire-fighters:
Wear positive pressure self-contained breathing apparatus (SCBA). Structural fire fighters' protective clothing provides limited protection in fire situations ONLY; it may not be effective in spill situations. Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Avoid contact with skin, eyes, and clothing. Keep people away from and upwind of spill/leak. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (Section 8). Warn unnecessary personnel to move away. Stop leak if you can do it without risk. Ensure adequate ventilation. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Personal protective equipment: Splash goggles. Wear protective clothing (chemical resistant suit and chemical resistant boots). Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent. Wear protective gloves (nitrile).

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures: Prevent dust cloud. Do not clean-up or dispose except under supervision of a specialist. In case of a spill and/or a leak, always shut off any sources of ignition, ventilate the area, and excercise caution. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Warn personnel to move away. Prevent entry into sewers, basements or confined areas; dike if needed.

Methods and materials for containment and cleaning up:
ELIMINATE all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if without risk. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. Use clean non-sparking tools to collect absorbed material. Dike far ahead of spill; use dry sand to contain the flow of material. Ventilate the area.

Environmental precautions:
Keep away from living quarters. Environmental hazard. Do not let product enter drains. Prevent further leakage or spillage if safe to do so. Water runoff can cause environmental damage. Prevent entry into sewers, basements or confined areas; dike if needed.

7. HANDLING AND STORAGE

Precautions for safe handling: Avoid inhalation of vapor or mist. Manipulate under an adequate fume hood. Do not ingest. Avoid contact with skin and eyes. Avoid exposure - obtain special instructions before use. Avoid prolonged or repeated exposure. Normal measures for preventive fire protection. Good general ventilation should be sufficient to control airborne levels. Keep container dry. Handle and open container with care. Wear suitable protective clothing, gloves and eye/face protection. When using do not eat, drink, or smoke. Keep away from sources of ignition.

Conditions for safe storage: Store locked up. Keep containers tightly closed in a cool, well-ventilated place. Keep away from incompatibles. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Avoid prolonged storage periods.

Storage incompatibilities: Store away from oxidizing agents

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits: No data available

Appropriate engineering controls:
Handle only in a fully enclosed system and equipment. Good general ventilation should be sufficient to control airborne levels. Ventilation is normally required when handling or using this product. Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substance. Follow safe industrial engineering/laboratory practices when handling any chemical.

Personal protective equipment

Respiratory protection: Dust respirator. Be sure to use a MSHA/NIOSH approved respirator or equivalent.
Hand protection: Wear protective gloves.
Eye protection: Safety glasses.
Skin and body protection: Wear protective clothing (chemical resistant suit and chemical resistant boots).

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state (20°C): Solid
Form: Crystal - Powder
Color: White - Almost white
Odor: No data available
Odor threshold: No data available

Melting point/freezing point:	89°C (192°F)	**pH:**	No data available
Boiling point/range:	No data available	**Vapor pressure:**	No data available
Decomposition temperature:	No data available	**Vapor density:**	No data available
Relative density:	No data available	**Dynamic Viscosity:**	No data available
Kinematic Viscosity:	No data available		
Partition coefficient: n-octanol/water (log P_{ow})	No data available	**Evaporation rate:** (Butyl Acetate = 1)	No data available
Flash point:	No data available	**Autoignition temperature:**	No data available
Flammability (solid, gas):	No data available	**Flammability or explosive limits:**	
		Lower:	No data available
		Upper:	No data available

Solubility(ies):

10. STABILITY AND REACTIVITY

10. STABILITY AND REACTIVITY

Reactivity: Not Available.
Chemical Stability: Stable under recommended storage conditions. (See Section 7)
Possibility of Hazardous Reactions: No hazardous reactivity has been reported.
Conditions to avoid: Avoid excessive heat and light.
Incompatible materials: Alkali, Bases, Oxidizing agents
Hazardous Decomposition Products: No data available

11. TOXICOLOGICAL INFORMATION

RTECS Number: KV9450000

Acute Toxicity:
orl-mus LD50:700 mg/kg orl-rat LD50:880 mg/kg

Skin corrosion/irritation:
No data available

Serious eye damage/irritation:
No data available

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
No data available

Carcinogenicity:

No data available

IARC: No data available **NTP:** No data available **OSHA:** No data available

Reproductive toxicity:
No data available

Routes of Exposure: Inhalation, Eye contact, Ingestion, Skin contact.
Symptoms related to exposure:
Overexposure may result in serious illness or death.
Potential Health Effects:
No specific information available; skin and eye contact may result in irriatation. May be harmful if inhaled or ingested.
Target organ(s): No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity

Fish: No data available
Crustacea: No data available
Algae: No data available

Persistence and degradability: No data available
Bioaccumulative potential (BCF): No data available
Mobillity in soil: No data available
Partition coefficient: No data available
n-octanol/water (log P_{ow})
Soil adsorption (Koc): No data available
Henry's Law: No data available
constant (PaM^3/mol)

13. DISPOSAL CONSIDERATIONS

Disposal of product: Recycle to process if possible. It is the generator's responsibility to comply with Federal, State and Local rules and regulations. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. This section is intended to provide assistance but does not replace these laws, nor does compliance in accordance with this section ensure regulatory compliance according to the law. US EPA guidelines for Identification and Listing of Hazardous Waste are listed in 40 CFR Parts 261. The product should not be allowed to enter the environment, drains, water ways, or the soil.

Disposal of container: Dispose of as unused product. Do not re-use empty containers.

Other considerations: Observe all federal, state and local regulations when disposing of the substance.

14. TRANSPORT INFORMATION

DOT (US)

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3077	Environmentally hazardous substance, solid, n.o.s.	9 Miscellaneous hazardous material	III

IATA

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3077	Environmentally hazardous substance, solid, n.o.s.	9 Miscellaneous hazardous material	III

IMDG

UN number:	Proper Shipping Name:	Class or Division:	Packing Group:
UN3077	Environmentally hazardous substance, solid, n.o.s.	9 Miscellaneous hazardous material	III

EmS number: F-A, S-F

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA 8b.):
This product is NOT on the EPA Toxic Substances Control Act (TSCA) inventory. The following notices are required by 40 CFR 720.36 (C) for those products not on the inventory list:
(i) These products are supplied solely for use in research and development by or under the supervision of a technically qualified individual as defined in 40 CFR 720.0 et sec.
(ii) The health risks of these products have not been fully determined. Any information that is or becomes available will be supplied on a SDS sheet.

US Federal Regulations

CERCLA Hazardous substance and Reportable Quantity:

SARA 313: Not Listed
SARA 302: Not Listed

State Regulations

State Right-to-Know

Massachusetts Not Listed
New Jersey Listed
Pennsylvania Not Listed
California Proposition 65: Listed

Other Information

NFPA Rating:

Health: 2
Flammability: 0
Instability: 0

HMIS Classification:

Health: 2
Flammability: 0
Physical: 0

International Inventories

WHMIS hazard class: D2A: Materials causing other toxic effects. (Very Toxic)
EC-No: 200-784-6

16. OTHER INFORMATION

Revision date: 08/15/2016

16. OTHER INFORMATION

Revision number: 3

TCI chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its affiliates or subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our SDS are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated SDS for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, face mask, fume hood). For proper handling and disposal, always comply with federal, state and local regulations.

DDT **ICSC: 0034 (April 2004)**

p,p'-DDT
Dichlorodiphenyltrichloroethane
1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane
2,2-bis(p-Chlorophenyl)-1,1,1-trichloroethane
1,1'-(2,2,2-Trichloroethylidene)bis(4-chlorobenzene)

CAS #: 50-29-3
UN #: 2761
EC Number: 200-024-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder, foam, carbon dioxide.

PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety goggles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Tremor. Diarrhoea. Dizziness. Headache. Vomiting. Numbness. Tingling sensation. Hyperexcitability. Convulsions.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Rest. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable, non-metallic containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from iron, aluminium, aluminium salts and food and feedstuffs. See Chemical Dangers.

PACKAGING

Do not transport with food and feedstuffs.
Severe marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

DDT **ICSC: 0034**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS CRYSTALS OR WHITE POWDER. TECHNICAL PRODUCT IS WAXY SOLID.

Physical dangers

Chemical dangers
On combustion, forms toxic and corrosive fumes including hydrogen chloride. Reacts with aluminium and iron.

Formula: $C_{14}H_9Cl_5$
Molecular mass: 354.5
Boiling point: 260°C
Melting point: 109°C
Density: 1.6 g/cm³
Solubility in water: poor
Octanol/water partition coefficient as log Pow: 6.36

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by ingestion.

Effects of short-term exposure
May cause mechanical irritation. The substance may cause effects on the central nervous system. This may result in convulsions and respiratory depression. Exposure at high levels could cause death. Medical observation is indicated.

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly , especially if powdered.

Effects of long-term or repeated exposure
The substance may have effects on the central nervous system and liver. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 1 mg/m^3, as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: (inhalable fraction): 1 mg/m^3; peak limitation category: II(8); skin absorption (H)

ENVIRONMENT

The substance is very toxic to aquatic organisms. This substance may be hazardous to the environment. Special attention should be given to birds. Bioaccumulation of this chemical may occur along the food chain, for example in milk and aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Carrier solvents used in commercial formulations may change physical and toxicological properties.
Do NOT take working clothes home.
Consult national legislation.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 25-40-48/25-50/53; S: (1/2)-22-36/37-45-60-61

ALDRIN **ICSC: 0774 (March 1998)**

1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-exo-1,4-endo-5,8-dimethanonaphthalene
1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-,(1alpha,4alpha,4aß,5alpha,8alpha,8aß)
HHDN

CAS #: 309-00-2
UN #: 2761
EC Number: 206-215-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media.

PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	See Ingestion.	Use ventilation (not if powder).	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! See Ingestion.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes		Wear safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Convulsions. Dizziness. Headache. Nausea. Vomiting. Muscle twitching.	Do not eat, drink, or smoke during work. Wash hands before eating.	Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting. Rest. Refer for medical attention .

SPILLAGE DISPOSAL

Do NOT wash away into sewer. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Personal protection: chemical protection suit including self-contained breathing apparatus.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs and incompatible materials. See Chemical Dangers. Well closed. Keep in a well-ventilated room. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.
Severe marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

ALDRIN **ICSC: 0774**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS CRYSTALS.

Physical dangers

Chemical dangers
Decomposes on heating. This produces toxic and corrosive fumes including hydrogen chloride. Reacts with acids and oxidants. Attacks many metals in the presence of water.

Formula: $C_{12}H_8Cl_6$
Molecular mass: 364.9
Boiling point at 0.27kPa: 145°C
Melting point: 104-105°C
Density: 1.6 g/cm³
Solubility in water: none
Vapour pressure, Pa at 20°C: 0.009
Octanol/water partition coefficient as log Pow: 7.4

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body through the skin and by ingestion.

Effects of short-term exposure
The substance may cause effects on the central nervous system. This may result in convulsions. The effects may be delayed. Medical observation is indicated.

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying.

Effects of long-term or repeated exposure
Cumulative effects are possible. See Acute Hazards/Symptoms.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.05 mg/m^3, as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: (inhalable fraction): 0.25 mg/m^3; peak limitation category: II(8); skin absorption (H)

ENVIRONMENT

The substance is very toxic to aquatic organisms. This substance may be hazardous to the environment. Special attention should be given to birds and bees. Bioaccumulation of this chemical may occur in aquatic organisms. It is strongly advised not to let the chemical enter into the environment because it is persistent. The substance may cause long-term effects in the aquatic environment. Avoid release to the environment in circumstances different to normal use.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
If the substance is formulated with solvent(s) also consult the card(s) (ICSC) of the solvent(s).
Carrier solvents used in commercial formulations may change physical and toxicological properties.
Do NOT take working clothes home.
The recommendations on this Card also apply to ICSC 0787 (dieldrin).

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 24/25-40-48/24/25-50/53; S: (1/2)-22-36/37-45-60-61

alpha-HEXACHLOROCYCLOHEXANE **ICSC: 0795 (November 2009)**

alpha-1,2,3,4,5,6-Hexachlorocyclohexane
alpha-Benzenehexachloride (alpha-BHC)
alpha-Hexachloran

CAS #: 319-84-6
UN #: 2761
EC Number: 206-270-8

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion if formulations contain flammable/explosive solvents.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! AVOID EXPOSURE OF BREASTFEEDING WOMEN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. See Ingestion.	Avoid inhalation of dust.	Fresh air, rest. Seek medical attention if you feel unwell.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. Rinse and then wash skin with water and soap. Seek medical attention if you feel unwell.
Eyes	Redness.	Wear face shield or eye protection in combination with breathing protection.	Rinse with plenty of water (remove contact lenses if easily possible).
Ingestion	Headache. Nausea. Vomiting. Diarrhoea. Dizziness. Tremor. Convulsions.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink, but NOT if convulsions occur. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance, chemical protection suit including self-contained breathing apparatus and protective gloves. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable non-metallic containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Well closed. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing. Separated from bases, metals and food and feedstuffs.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Toxic if swallowed
May be harmful in contact with skin
Suspected of causing cancer
May cause harm to breast-fed children
Causes damage to central nervous system
May cause damage to liver and kidneys through prolonged or repeated exposure
Very toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

alpha-HEXACHLOROCYCLOHEXANE **ICSC: 0795**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
BROWN-TO-WHITE CRYSTALLINE POWDER WITH CHARACTERISTIC ODOUR.

Physical dangers
No data.

Chemical dangers
Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive fumes including chlorine (see ICSC 0126), hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Reacts with bases and powdered metals.

Formula: $C_6H_6Cl_6$
Molecular mass: 290.8
Boiling point: 288°C
Melting point: 157-160°C
Density: 1.9 g/cm³
Solubility in water: very poor
Vapour pressure, Pa at 20°C: 0.003
Relative vapour density (air = 1): 10
Octanol/water partition coefficient as log Pow: 3.8

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

Effects of short-term exposure
The substance may cause effects on the central nervous system. This may result in convulsions.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
The substance may have effects on the central nervous system, kidneys and liver. This substance is probably carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

MAK: (inhalable fraction): 0.1 mg/m^3; peak limitation category: II(8); skin absorption (H); carcinogen category: 4; pregnancy risk group: D

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur along the food chain, for example in fish and seafood. The substance may cause long-term effects in the aquatic environment. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

This substance is a component of the insecticide hexachlorocyclohexane (mixed isomers).
Carrier solvents used in commercial formulations may change physical and toxicological properties.
The symptoms of convulsions do not become manifest until 0.5 to several hours.
Do NOT take working clothes home.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.
See ICSCs 0053, 0487 and 0796.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 21-25-40-50/53; S: (1/2)-22-36/37-45-60-61; Note: C

AccuStandard, Inc.
125 Market St., New Haven, CT 06513 USA
Tel: 203-786-5290 Fax: 203-786-5287

SAFETY DATA SHEET

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

1.1 - Product Identifiers

Catalog Name: P-134N

Description: a-Chlordane

CAS No.: 5103-71-9

1.2 - Relevant Identified Uses of the Substance or Mixture

Laboratory Chemical Reference Material

1.3 - Supplier Details

Company: AccuStandard, Inc.
125 Market St.
New Haven, CT 06513 USA

Telephone Number: 203-786-5290

Fax: 203-786-5287

Email: edocs@accustandard.com

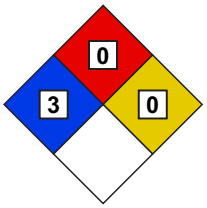
1.4 - Emergency Telephone Number

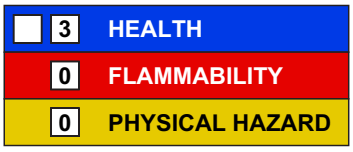
Emergency Phone #: AccuStandard, Inc.
1-203-502-7070 (USA)
+001-203-502-7070 (International)

24 hours / 7 days a week

SECTION 2 - HAZARDS IDENTIFICATION

2.1 - GHS Label Elements





Signal Word: Danger

Hazard Codes:

H302 - Harmful if swallowed. (Acute toxicity, oral, category 4)

H311 - Toxic if absorbed through skin. (Acute toxicity, dermal, category 3)

H315 - Irritating to skin. (Skin corrosion/irritation, category 2)

H320 - Irritating to eyes. (Eye damage/irritation, category 2B)

H335 - May be irritating to mucous membrane and upper respiratory system. (Specific target organ toxicity, single exposure; Respiratory tract irritation, category 3)

H350 - California Proposition 65 Warning: This product contains a component (or components) that may cause cancer in a concentration greater than or equal to 0.1%.

H351 - This product is or contains a component that is classified (ACGIH, IARC, NTP, OSHA) as a suspect cancer hazard. (Carcinogenicity, category 2)

SECTION 2 - HAZARDS IDENTIFICATION *- continued*

2.1 - GHS Label Elements *- continued*

H371 - May cause liver damage. (Specific target organ toxicity, single exposure, category 2)

H401 - Toxic to fish and other water organisms. (H410)

H413 - May cause long-term adverse effects in the aquatic environment.

Precautionary Codes:

P202 - This product should only by used by persons trained in the safe handling of hazardous chemicals.

P233 - Store in a tightly closed container. (P404)

P260 - Do not breathe dust.

P262 - Do not get in eyes, on skin or clothing.

P264 - Wash thoroughly after handling. Do not take internally. Eye wash and safety equipment should be readily available.

P284 - Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), or a risk assessment shows air-purifying respirators are appropriate, use of a NIOSH/MSHA approved air supplied respirator is advised. Use a full-face respirator with multi-purpose combination (US) or type ABEK (EN14387) respirator cartridges in absence of proper environmental control. Always use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Engineering and/or administrative controls should be implemented to reduce exposure.

P338 - Eye contact: Immediately flush with plenty of water. After initial flushing, remove and contact lenses and continue flushing for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers.

P360 - Skin contact: Immediately wash skin with soap and plenty of water. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.

2.2 - Other Hazards

2.2.1 - Symptom of Exposure Health/Environment

TOXIC.

Exposure can cause headache, nausea, confusion, drowsiness, dizziness and/or vomiting.

May cause liver damage. (Specific target organ toxicity, single exposure, category 2)

May cause hypersensitivity to stimulation, sensation of prickling, tingling or creeping on skin.

May cause incoordination, tremor, mental confusion and hyper-excitable state.

Overexposure by any route to chlorinated insecticides may cause headache, nausea, vomiting, nervousness and hyperactivity, unusual sensations and fatigue. Convulsions and coma may follow.

Toxic to fish and other water organisms. (H410)

May cause long-term adverse effects in the aquatic environment. (H413)

2.2.2 - Potential Health Effects

Irritating to eyes. (Eye damage/irritation, category 2B)

Irritating to skin. (Skin corrosion/irritation, category 2)

Toxic if absorbed through skin. (Acute toxicity, dermal, category 3)

May be irritating to mucous membrane and upper respiratory system. (Specific target organ toxicity, single exposure; Respiratory tract irritation, category 3)

May be harmful if inhaled. (Acute toxicity, inhalation, category 5)

Harmful if swallowed. (Acute toxicity, oral, category 4)

2.2.3 - Routes of Entry

Inhalation, ingestion or skin contact.

2.2.4 - Carcinogenicity

California Proposition 65 cancer hazard.

SECTION 2 - HAZARDS IDENTIFICATION *- continued*

2.2 - Other Hazards *- continued*

2.2.4 - Carcinogenicity *- continued*

This product is or contains a component that is classified (ACGIH, IARC, NTP, OSHA) as a suspect cancer hazard. (Carcinogenicity, category 2)

California Proposition 65 Warning: This product contains a component (or components) that may cause cancer in a concentration greater than or equal to 0.1%.

SECTION 3 - COMPOSITION / ANALYTES DATA

Description: a-Chlordane

Synonyms: 1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methanoindene

Molecular Weight: 409.76

Molecular Formula: C10H6Cl8

EC#: 225-825-5

			ACGIH -TLV (mg/m³)			OSHA -PEL (mg/m³)		
Analyte	CAS #	% Concentration	TWA	STEL	Skin	TWA	STEL	Skin
a-Chlordane	5103-71-9	100.000	0.5		X	0.5		

SECTION 4 - FIRST AID MEASURES

4.1 - First Aid Procedures - General

Get medical assistance for all cases of overexposure.

4.2 - Eye Contact

Eye contact: Immediately flush with plenty of water. After initial flushing, remove and contact lenses and continue flushing for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. (P338)

4.3 - Skin Contact

Skin contact: Immediately wash skin with soap and plenty of water. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse. (P360)

4.4 - Inhalation

Inhalation: Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Seek immediate medical attention.

4.5 - Ingestion

Ingestion: Call a physician or poison control center immediately. ONLY induce vomiting at the instructions of a physician. Never give anything by mouth to an unconscious person.

SECTION 5 - FIRE FIGHTING MEASURES

5.1 - Flammable Properties

During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

5.2 - Extinguishing Media

Use alcohol foam, carbon dioxide, or dry chemical when fighting fires involving this material.

Do not use water.

5.3 - Protection of Firefighters

As in any fire, wear self-contained breathing apparatus pressure demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

6.1 - Spill Response

Wear a self-contained breathing apparatus and appropriate Personal protection. Prevent contact with skin or eyes. Ventilate area. Avoid raising dust. Take up and containerize for proper disposal. Flush spill area with water. Comply with Federal, State, and local regulations.

SECTION 7 - HANDLING AND STORAGE

Store in a tightly closed container. (P404)

Store in a cool area away from ignition sources and oxidizers.

Do not breathe dust. (P260)

Use with adequate ventilation.

Do not get in eyes, on skin or clothing. (P262)

Avoid prolonged or repeated exposure.

This product should only by used by persons trained in the safe handling of hazardous chemicals. (P202)

SECTION 8 - EXPOSURE CONTROLS

8.1 - Engineering Controls/PPE

Wash thoroughly after handling. Do not take internally. Eye wash and safety equipment should be readily available. (P264)

8.2 - General Hygene Considerations

Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), or a risk assessment shows air-purifying respirators are appropriate, use of a NIOSH/MSHA approved air supplied respirator is advised. Use a full-face respirator with multi-purpose combination (US) or type ABEK (EN14387) respirator cartridges in absence of proper environmental control. Always use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Engineering and/or administrative controls should be implemented to reduce exposure.

Material must be handled or transferred in an approved fume hood or with equivalent ventilation.

Compatible chemical-resistant protective gloves must be worn to prevent skin contact. Inspect gloves prior to use. Use proper glove removal technique to avoid contact with product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash hands thoroughly and dry.

Use eye protection tested and approved under the appropriate government standards such as NIOSH (US) or EN 166 (EU).

All recommendations are advisory only and must be evaluated by an industrial hygienist and/or safety officer familiar with the specific situation of anticipated use, such as concentration and amount of the substance in the workplace. Any recommendation should not be construed as offering an approval for any specific use of the product.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Colorless, crystalline solid

Odor: Odorless

Odor Threshold: N/A

pH: N/A

Melting Point: 106 - 107 °C

Boiling Point: N/A

Flash Point: N/A

Evaporation Rate (Butyl Acetate=1): N/A

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES *- continued*

Flammability Class: N/A

Lower Flammability Level: N/A

Upper Flammability Level: N/A

Vapor Pressure: 1.3 mPa @ 25 °C

Vapor Density (Air = 1): N/A

Specific Gravity: 1.59 g/cm3

Solubility in Water: 0.1 mg/L

Partition Coefficient: log Pow: 6.0

Autoignition Temperature: N/A

Decomposition Temperature: N/A

Viscosity: N/A

VOC Content: N/A

Percent Volatile: N/A

SECTION 10 - STABILITY AND REACTIVITY

Stability: Stable

Materials to Avoid: Oxidizers
Bases

Hazardous Decomposition: Oxides of carbon; Hydrogen chloride

Hazardous Polymerization: Will not occur

Condition to Avoid: Excessive heat; Exposure to UV light

SECTION 11 - TOXICOLOGICAL INFORMATION

Human Health Toxicity

See section 2 for specific toxicological information for the ingredients of this product.

LD50 (Oral): Rat - 500 mg/kg

LD50 (Dermal) : Rabbit - 200 mg/kg

LC50 (Inhalation): N/A

WARNING: This product contains chemical(s) known to the state of California to cause cancer.

No other information related to the toxicological properties of this product is available at this time.

SECTION 12 - ECOLOGICAL INFORMATION

Environmental Toxicity

By complying with sections 6 and 7 there should be no release to the environment.

LC50 (Fish): 0.09 mg/L 96H

EC50 (Aquatic Invertebrate): 0.56 mg/L 48H

BCF: 322

Threshold for concern
Moderate potential to bioaccumulate

No other information related to the ecological properties of this product is available at this time.

SECTION 13 - DISPOSAL CONSIDERATIONS

Recycle or incinerate at any EPA approved facility or dispose in compliance with Federal, State and local regulations. Empty containers must be triple-rinsed prior to disposal.

SECTION 14 - TRANSPORT INFORMATION

Transportation Information (DOT/IATA)

UN Number: UN2811

Class: 6.1

Packing Group: III

Proper Shipping Name: Toxic solid, organic, n.o.s. (a-Chlordane)

Poison by Inhalation: No

Marine Pollutant: No

SECTION 15 - REGULATORY INFORMATION

WARNING: This product contains chemical(s) known to the state of California to cause cancer.

This product is subject to SARA section 313 reporting requirements.

The CAS number of this product is NOT listed on the TSCA Inventory.

For laboratory, research and development use only. Not for manufacturing or commercial purposes.

In addition to federal and state regulations, local regulations may apply. Check with your local regulatory authorities.

SECTION 16 - OTHER INFORMATION

This document has been designed to meet the requirements of OSHA, ANSI, GHS and CHIPs regulations. Chemicals are classified using the Globally Harmonized System for Classification and Labeling of Chemicals and CLP Regulation (EC) No. 1272/2008.

The statements contained herein are offered for informational purposes only and are based on technical data that we believe to be accurate. The manufacturer will not assume any liability for the accuracy and completeness of this information. Final determination of the suitability of the material is the responsibility of the user. Although certain hazards are described herein, the user should not presume that these are the only hazards that exist. Since conditions and manner of use are outside of the manufacturers control, we make

NO WARRANTY OF MERCHANTABILITY, EXPRESSED OR IMPLIED, AND ASSUME NO LIABILITY RESULTING FROM ITS USE.

Legend : N/A = Not Available ND = Not Determined NR = Not Regulated

HMIS/NFPA HAZARD INDEX

0 - Minimal
1 - Slight
2 - Moderate
3 - Serious
4 - Severe

* - Additional Hazard

GHS HAZARD INDEX

Category 1 - Most Severe
Category 5 - Least Severe

**** End of Document ****

beta-HEXACHLOROCYCLOHEXANE **ICSC: 0796 (November 2009)**

1-alpha,2-beta,3-alpha,4-beta,5-alpha,6-beta-Hexachlorocyclohexane
beta-1,2,3,4,5,6-Hexachlorocyclohexane
beta-Benzenehexachloride (beta-BHC)

CAS #: 319-85-7
UN #: 2761
EC Number: 206-271-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion if formulations contain flammable/explosive solvents.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! AVOID EXPOSURE OF BREASTFEEDING WOMEN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. See Ingestion.	Avoid inhalation of dust.	Fresh air, rest. Seek medical attention if you feel unwell.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. Rinse and then wash skin with water and soap. Seek medical attention if you feel unwell.
Eyes	Redness.	Wear face shield or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Headache. Nausea. Vomiting. Dizziness. Diarrhoea. Tremor. Convulsions.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink, but NOT if convulsions occur. Refer immediately for medical attention.

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance, chemical protection suit including self-contained breathing apparatus and protective gloves. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable non-metallic containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Well closed. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing. Separated from bases, metals and food and feedstuffs.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Toxic if swallowed
May be harmful in contact with skin
Suspected of causing cancer
May cause harm to breast-fed children
May cause damage to central nervous system
May cause damage to liver and kidneys through prolonged or repeated exposure if swallowed
Very toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

beta-HEXACHLOROCYCLOHEXANE **ICSC: 0796**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
WHITE CRYSTALLINE POWDER.

Physical dangers

Chemical dangers
Decomposes on contact with hot surfaces or flames. This produces toxic and corrosive fumes including chlorine (see ICSC 0126), hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Reacts with bases and powdered metals.

Formula: $C_6H_6Cl_6$
Molecular mass: 290.8
Boiling point at 0.07Pa: 60°C
Melting point: 309°C
Density: 1.9 g/cm³
Solubility in water: very poor
Vapour pressure, Pa at 20°C: 0.7
Octanol/water partition coefficient as log Pow: 3.8

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

Effects of short-term exposure
The substance may cause effects on the central nervous system. This may result in convulsions.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
The substance may have effects on the central nervous system, liver and kidney. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

OCCUPATIONAL EXPOSURE LIMITS

MAK: (inhalable fraction): 0.1 mg/m^3; peak limitation category: II(8); skin absorption (H); carcinogen category: 4; pregnancy risk group: D

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur along the food chain, for example in fish and seafood. The substance may cause long-term effects in the aquatic environment. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

This substance is a component of the insecticide hexachlorocyclohexane (isomer mixture).
Carrier solvents used in commercial formulations may change physical and toxicological properties.
Do NOT take working clothes home.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.
See ICSCs 0053, 0487 and 0795.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 21-25-40-50/53; S: (1/2)-22-36/37-45-60-61; Note: C

CHLORDANE (TECHNICAL PRODUCT) **ICSC: 0740 (March 1998)**

1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methanoindene
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene

CAS #: 57-74-9
UN #: 2996
EC Number: 200-349-0

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use alcohol-resistant foam, powder, carbon dioxide, water spray.

PREVENT GENERATION OF MISTS! STRICT HYGIENE! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	See Ingestion.	Use breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Wear safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Confusion. Convulsions. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rest. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: chemical protection suit including self-contained breathing apparatus. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs, bases and incompatible materials. See Chemical Dangers. Well closed. Keep in a well-ventilated room.

PACKAGING

Do not transport with food and feedstuffs.
Severe marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

CHLORDANE (TECHNICAL PRODUCT) **ICSC: 0740**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
TECHNICAL-GRADE PRODUCT: LIGHT YELLOW-TO-AMBER VISCOUS LIQUID.

Physical dangers

Chemical dangers
Decomposes on burning. Decomposes on contact with bases. This produces toxic fumes including phosgene and hydrogen chloride. Attacks iron, zinc, plastics, rubber and coatings.

Formula: $C_{10}H_6Cl_8$
Molecular mass: 409.8
Boiling point at 0.27kPa: 175°C
Relative density (water = 1): 1.59 - 1.63
Solubility in water: none
Vapour pressure, Pa at 25°C: 0.0013
Octanol/water partition coefficient as log Pow: 2.78

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
Exposure at high levels could cause disorientation, tremors, convulsions, respiratory failure and death. Medical observation is indicated.

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying.

Effects of long-term or repeated exposure
The substance may have effects on the liver and immune system. This may result in tissue lesions and liver impairment. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: (inhalable fraction and vapour): 0.5 mg/m^3, as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: (inhalable fraction): 0.5 mg/m^3; peak limitation category: II(8); skin absorption (H); carcinogen category: 3

ENVIRONMENT

The substance is very toxic to aquatic organisms. This substance may be hazardous to the environment. Special attention should be given to soil organisms and bees. It is strongly advised not to let the chemical enter into the environment. The substance may cause long-term effects in the aquatic environment.

NOTES

If the substance is formulated with solvent(s) also consult the card(s) (ICSC) of the solvent(s).
Carrier solvents used in commercial formulations may change physical and toxicological properties.
See ICSC 0743.

ADDITIONAL INFORMATION

EC Classification
Symbol: Xn, N; R: 21/22-40-50/53; S: (2)-36/37-60-61

SAFETY DATA SHEET

Version 5.5
Revision Date 06/02/2016
Print Date 11/12/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : δ-HCH

Product Number : 33377
Brand : Sigma-Aldrich
Index-No. : 602-042-00-0

CAS-No. : 319-86-8

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Dermal (Category 4), H312
Carcinogenicity (Category 2), H351
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H301 Toxic if swallowed.
H312 Harmful in contact with skin.
H351 Suspected of causing cancer.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.

P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P322	Specific measures (see supplemental first aid instructions on this label).
P330	Rinse mouth.
P363	Wash contaminated clothing before reuse.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	$C_6H_6Cl_6$
Molecular weight	:	290.83 g/mol
CAS-No.	:	319-86-8
EC-No.	:	206-272-9
Index-No.	:	602-042-00-0

Hazardous components

Component	Classification	Concentration
1α,2α,3α,4β,5α,6β)-1,2,3,4,5,6-Hexachlorocyclohexane		
	Acute Tox. 3; Acute Tox. 4; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301, H312, H351, H410	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.Normal measures for preventive fire protection.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	No data available
f)	Initial boiling point and boiling range	No data available
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available

p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 1,000 mg/kg

Inhalation: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC: 2B - Group 2B: Possibly carcinogenic to humans (1α,2α,3α,4β,5α,6β)-1,2,3,4,5,6-Hexachlorocyclohexane)

IARC: 2B - Group 2B: Possibly carcinogenic to humans (1α,2α,3α,4β,5α,6β)-1,2,3,4,5,6-Hexachlorocyclohexane)

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: Reasonably anticipated to be a human carcinogen (1α,2α,3α,4β,5α,6β)-1,2,3,4,5,6-Hexachlorocyclohexane)

NTP: Reasonably anticipated to be a human carcinogen (1α,2α,3α,4β,5α,6β)-1,2,3,4,5,6-Hexachlorocyclohexane)

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: GV4550000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Central nervous system -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - other fish - 2.83 mg/l - 96.0 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential

Bioaccumulation	other fish - 33 d - 0.955 mg/l
	Bioconcentration factor (BCF): 326

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (1α,2α,3α,4β,5α,6β)-1,2,3,4,5,6-Hexachlorocyclohexane)
Reportable Quantity (RQ): 1 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (1α,2α,3α,4β,5α,6β)-1,2,3,4,5,6-Hexachlorocyclohexane)
Marine pollutant:yes

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (1α,2α,3α,4β,5α,6β)-1,2,3,4,5,6-Hexachlorocyclohexane)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1α,2α,3α,4β,5α,6β)-1,2,3,4,5,6-Hexachlorocyclohexane	319-86-8	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1α,2α,3α,4β,5α,6β)-1,2,3,4,5,6-Hexachlorocyclohexane	319-86-8	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
1α,2α,3α,4β,5α,6β)-1,2,3,4,5,6-Hexachlorocyclohexane	319-86-8	1993-04-24

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer. 1α,2α,3α,4β,5α,6β)-1,2,3,4,5,6-Hexachlorocyclohexane	CAS-No. 319-86-8	Revision Date 2015-08-14

WARNING! This product contains a chemical known to the State of California to cause cancer. 1α,2α,3α,4β,5α,6β)-1,2,3,4,5,6-Hexachlorocyclohexane	CAS-No. 319-86-8	Revision Date 2015-08-14

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H301	Toxic if swallowed.
H312	Harmful in contact with skin.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	1
Fire Hazard:	0
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.5 Revision Date: 06/02/2016 Print Date: 11/12/2018

DIELDRIN **ICSC: 0787 (March 1998)**

1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo-1,4-exo- 5,8-dimethanonaphthalene
3,4,5,6,9,9-Hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aalpha,2ß,2aalpha,3ß,6ß,6aalpha,7ß,7aalpha)-2,7:3,6-dimethanonaphth(2,3-b)oxirene
HEOD

CAS #: 60-57-1
UN #: 2761
EC Number: 200-484-5

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media.

PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	See Ingestion.	Use ventilation (not if powder).	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! See Ingestion.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes		Wear safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Convulsions. Dizziness. Headache. Nausea. Vomiting. Muscle twitching.	Do not eat, drink, or smoke during work. Wash hands before eating.	Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting. Rest. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT wash away into sewer. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs and incompatible materials. See Chemical Dangers. Well closed. Keep in a well-ventilated room. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.
Severe marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

International Labour Organization
World Health Organization

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

European Commission

DIELDRIN **ICSC: 0787**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS CRYSTALS.

Physical dangers

Chemical dangers
Decomposes on heating. This produces toxic fumes including hydrogen chloride. Reacts with oxidants and acids. Attacks metals due to the slow formation of hydrogen chloride in storage.

Formula: $C_{12}H_8Cl_6O$
Molecular mass: 380.9
Melting point: 175-176°C
Density: 1.7 g/cm³
Solubility in water: none
Vapour pressure, Pa at 20°C: 0.0004
Octanol/water partition coefficient as log Pow: 6.2

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body through the skin and by ingestion.

Effects of short-term exposure
The substance may cause effects on the central nervous system. This may result in convulsions. Medical observation is indicated.

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying.

Effects of long-term or repeated exposure
Cumulative effects are possible. See Acute Hazards/Symptoms.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.1 mg/m^3, as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: (inhalable fraction): 0.25 mg/m^3; peak limitation category: II(8); skin absorption (H)

ENVIRONMENT

The substance is very toxic to aquatic organisms. This substance may be hazardous to the environment. Special attention should be given to bees and birds. Bioaccumulation of this chemical may occur in aquatic organisms. It is strongly advised not to let the chemical enter into the environment because it is persistent. The substance may cause long-term effects in the aquatic environment. Avoid release to the environment in circumstances different to normal use.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
If the substance is formulated with solvent(s) also consult the card(s) (ICSC) of the solvent(s).
Carrier solvents used in commercial formulations may change physical and toxicological properties.
Do NOT take working clothes home.
See ICSC 0774.

ADDITIONAL INFORMATION

EC Classification
Symbol: T+, N; R: 25-27-40-48/25-50/53; S: (1/2)-22-36/37-45-60-61

SAFETY DATA SHEET
Endosulfan I

Revision: 09/22/2018

according to Regulation (EC) No. 1907/2006 as amended by (EC) No. 2015/830 and US OSHA HCS 2015

Section 1. Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product Code: 24253

Product Name: Endosulfan I

Synonyms: (3.alpha.,5a.beta.,6.alpha.,9.alpha.,9a.beta.)-6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano-2,4,3-benzodioxathiepin 3-oxide; .alpha.-Endosulfan; Endosulfan A;

1.2 Relevant identified uses of the substance or mixture and uses advised against:

Relevant identified uses: For research use only, not for human or veterinary use.

1.3 Details of the Supplier of the Safety Data Sheet:

Company Name: Cayman Chemical Company
1180 E. Ellsworth Rd.
Ann Arbor, MI 48108

Web site address: www.caymanchem.com

Information: Cayman Chemical Company +1 (734)971-3335

1.4 Emergency telephone number:

Emergency Contact: CHEMTREC Within USA and Canada: +1 (800)424-9300
CHEMTREC Outside USA and Canada: +1 (703)527-3887

Section 2. Hazards Identification

2.1 Classification of the Substance or Mixture:

Acute Toxicity: Oral, Category 3

Aquatic Toxicity (Acute), Category 1

2.2 Label Elements:

GHS Signal Word: **Danger**

GHS Hazard Phrases:

H301: Toxic if swallowed.

H400: Very toxic to aquatic life.

GHS Precaution Phrases:

P264: Wash {hands} thoroughly after handling.

P273: Avoid release to the environment.

GHS Response Phrases:

P301+310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.

P330: Rinse mouth.

P391: Collect spillage.

GHS Storage and Disposal Phrases:

Please refer to Section 7 for Storage and Section 13 for Disposal information.

2.3 Adverse Human Health Effects and Symptoms: Material may be irritating to the mucous membranes and upper respiratory tract.
May be harmful by inhalation or skin absorption.
May cause eye, skin, or respiratory system irritation.
Toxic if swallowed.
Very toxic to aquatic life
To the best of our knowledge, the toxicological properties have not been thoroughly investigated.

Section 3. Composition/Information on Ingredients

CAS # / RTECS #	Hazardous Components (Chemical Name)/ REACH Registration No.	Concentration	EC No./ EC Index No.	GHS Classification
959-98-8 RB9275100	.alpha.-Endosulfan	100.0 %	625-034-9 NA	Acute Tox.(O) 3: H301 Aquatic (A) 1: H400

Section 4. First Aid Measures

4.1 Description of First Aid Measures:

In Case of Inhalation: Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Get immediate medical attention.

In Case of Skin Contact: Immediately wash skin with soap and plenty of water for at least 15 minutes. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.

In Case of Eye Contact: Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Have eyes examined and tested by medical personnel.

In Case of Ingestion: Wash out mouth with water provided person is conscious. Never give anything by mouth to an unconscious person. Get medical attention. Do NOT induce vomiting unless directed to do so by medical personnel.

Section 5. Fire Fighting Measures

5.1 Suitable Extinguishing Media: Use alcohol-resistant foam, carbon dioxide, water, or dry chemical spray.
Use water spray to cool fire-exposed containers.

Unsuitable Extinguishing Media: A solid water stream may be inefficient.

5.2 Flammable Properties and Hazards: No data available.

No data available.

Flash Pt: No data.

Explosive Limits: LEL: No data. UEL: No data.

Autoignition Pt: No data.

5.3 Fire Fighting Instructions: As in any fire, wear self-contained breathing apparatus pressure-demand (NIOSH approved or equivalent), and full protective gear to prevent contact with skin and eyes.

Section 6. Accidental Release Measures

6.1 Protective Precautions, Protective Equipment and Emergency Procedures: Avoid breathing vapors and provide adequate ventilation. As conditions warrant, wear a NIOSH approved self-contained breathing apparatus, or respirator, and appropriate personal protection (rubber boots, safety goggles, and heavy rubber gloves).

6.2 Environmental Precautions: Take steps to avoid release into the environment, if safe to do so.

6.3 Methods and Material For Containment and Cleaning Up: Contain spill and collect, as appropriate. Transfer to a chemical waste container for disposal in accordance with local regulations.

Section 7. Handling and Storage

7.1 Precautions To Be Taken in Handling: Avoid breathing dust/fume/gas/mist/vapours/spray. Avoid prolonged or repeated exposure.

7.2 Precautions To Be Taken in Storing: Keep container tightly closed. Store in accordance with information listed on the product insert.

Section 8. Exposure Controls/Personal Protection

8.1 Exposure Parameters:

8.2 Exposure Controls:

8.2.1 Engineering Controls (Ventilation etc.): Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

8.2.2 Personal protection equipment:

Eye Protection: Safety glasses

Protective Gloves: Compatible chemical-resistant gloves

Other Protective Clothing: Lab coat

Respiratory Equipment (Specify Type): NIOSH approved respirator, as conditions warrant.

Work/Hygienic/Maintenance Practices: Do not take internally. Facilities storing or utilizing this material should be equipped with an eyewash and a safety shower. Wash thoroughly after handling.

No data available.

Section 9. Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties

Physical States:	[ ] Gas [ ] Liquid [X] Solid
Appearance and Odor:	A solid
pH:	No data.
Melting Point:	No data.
Boiling Point:	No data.
Flash Pt:	No data.
Evaporation Rate:	No data.
Flammability (solid, gas):	No data available.
Explosive Limits:	LEL: No data. UEL: No data.
Vapor Pressure (vs. Air or mm Hg):	No data.
Vapor Density (vs. Air = 1):	No data.

	Specific Gravity (Water = 1):	No data.
	Solubility in Water:	No data.
	Solubility Notes:	Soluble (slightly) in: MeOH; DMSO; chloroform;
	Octanol/Water Partition Coefficient:	No data.
	Autoignition Pt:	No data.
	Decomposition Temperature:	No data.
	Viscosity:	No data.
9.2	**Other Information**	
	Percent Volatile:	No data.
	Molecular Formula & Weight:	C9H6Cl6O3S 406.9

Section 10. Stability and Reactivity

10.1	**Reactivity:**	No data available.
10.2	**Stability:**	Unstable [ ] Stable [X]
10.3	**Stability Note(s):**	Stable if stored in accordance with information listed on the product insert.
	Polymerization:	Will occur [ ] Will not occur [X]
10.4	**Conditions To Avoid:**	No data available.
10.5	**Incompatibility - Materials To Avoid:**	strong oxidizing agents
10.6	**Hazardous Decomposition or Byproducts:**	carbon dioxide carbon monoxide hydrogen chloride gas sulfur oxides

Section 11. Toxicological Information

11.1	**Information on Toxicological Effects:**	The toxicological effects of this product have not been thoroughly studied. Endosulfan I - Toxicity Data: Oral LD50 (rat): 76 mg/kg;
	Chronic Toxicological Effects:	Endosulfan I - Investigated as an agricultural chemical and mutagen Only select Registry of Toxic Effects of Chemical Substances (RTECS) data is presented here. See actual entry in RTECS for complete information. Endosulfan I RTECS Number:RB9275100
	Carcinogenicity:	NTP? No IARC Monographs? No OSHA Regulated? No

CAS #	Hazardous Components (Chemical Name)	NTP	IARC	ACGIH	OSHA
959-98-8	.alpha.-Endosulfan	n.a.	n.a.	n.a.	n.a.

Section 12. Ecological Information

12.1	**Toxicity:**	Avoid release into the environment. Runoff from fire control or dilution water may cause pollution.
12.2	**Persistence and Degradability:**	No data available.
12.3	**Bioaccumulative Potential:**	No data available.
12.4	**Mobility in Soil:**	No data available.
12.5	**Results of PBT and vPvB assessment:**	No data available.
12.6	**Other adverse effects:**	No data available.

Section 13. Disposal Considerations

13.1 Waste Disposal Method: Dispose in accordance with local, state, and federal regulations.

Section 14. Transport Information

14.1 LAND TRANSPORT (US DOT):

DOT Proper Shipping Name: Toxic solid, organic, n.o.s. (Endosulfan I)

DOT Hazard Class: 6.1 POISON

UN/NA Number: UN2811 **Packing Group:** III

14.1 LAND TRANSPORT (European ADR/RID):

ADR/RID Shipping Name: Toxic solid, organic, n.o.s. (Endosulfan I)

UN Number: 2811 **Packing Group:** III

Hazard Class: 6.1 - POISON

14.3 AIR TRANSPORT (ICAO/IATA):

ICAO/IATA Shipping Name: Toxic solid, organic, n.o.s. (Endosulfan I)

UN Number: 2811 **Packing Group:** III

Hazard Class: 6.1 - POISON **IATA Classification:** 6.1

Additional Transport Information: Transport in accordance with local, state, and federal regulations.
When sold in quantities of less than or equal to 1 mL, or 1 g, with an Excepted Quantity Code of E1, E2, E4, or E5, this item meets the De Minimis Quantities exemption, per IATA 2.6.10. Therefore packaging does not have to be labeled as Dangerous Goods/Excepted Quantity.

Section 15. Regulatory Information

EPA SARA (Superfund Amendments and Reauthorization Act of 1986) Lists

CAS #	Hazardous Components (Chemical Name)	S. 302 (EHS)	S. 304 RQ	S. 313 (TRI)
959-98-8	.alpha.-Endosulfan	No	Yes 1 LB	No

CAS #	Hazardous Components (Chemical Name)	Other US EPA or State Lists
959-98-8	.alpha.-Endosulfan	CAA HAP,ODC: No; CWA NPDES: Yes; TSCA: Yes - Inventory; CA PROP.65: No

Regulatory Information Statement: This SDS was prepared in accordance with 29 CFR 1910.1200 and Regulation (EC) No.1272/2008.

Section 16. Other Information

Revision Date: 09/22/2018

Additional Information About This Product: No data available.

Company Policy or Disclaimer: DISCLAIMER: This information is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.

SAFETY DATA SHEET
Endosulfan II

Revision: 06/16/2018

according to Regulation (EC) No. 1907/2006 as amended by (EC) No. 1272/2008

Section 1. Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product Code: 24254

Product Name: Endosulfan II

Synonyms: (3.alpha.,5a.alpha.,6.beta.,9.beta.,9a.alpha.)-6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano-2,4,3-benzodioxathiepin 3-oxide; .beta.-Endosulfan; Endosulfan B;

1.2 Relevant identified uses of the substance or mixture and uses advised against:

Relevant identified uses: For research use only, not for human or veterinary use.

1.3 Details of the Supplier of the Safety Data Sheet:

Company Name: Cayman Chemical Company
1180 E. Ellsworth Rd.
Ann Arbor, MI 48108

Web site address: www.caymanchem.com

Information: Cayman Chemical Company +1 (734)971-3335

1.4 Emergency telephone number:

Emergency Contact: CHEMTREC Within USA and Canada: +1 (800)424-9300
CHEMTREC Outside USA and Canada: +1 (703)527-3887

Section 2. Hazards Identification

2.1 Classification of the Substance or Mixture:

Acute Toxicity: Oral, Category 3

Aquatic Toxicity (Acute), Category 1

2.2 Label Elements:

GHS Signal Word: **Danger**

GHS Hazard Phrases:

H301: Toxic if swallowed.

H400: Very toxic to aquatic life.

GHS Precaution Phrases:

P264: Wash {hands} thoroughly after handling.

P273: Avoid release to the environment.

GHS Response Phrases:

P301+310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.

P330: Rinse mouth.

P391: Collect spillage.

GHS Storage and Disposal Phrases:

Please refer to Section 7 for Storage and Section 13 for Disposal information.

2.3 Adverse Human Health Effects and Symptoms: Material may be irritating to the mucous membranes and upper respiratory tract.
May be harmful by inhalation or skin absorption.
May cause eye, skin, or respiratory system irritation.
Toxic if swallowed.
Very toxic to aquatic life.
To the best of our knowledge, the toxicological properties have not been thoroughly investigated.

Section 3. Composition/Information on Ingredients

CAS # / RTECS #	Hazardous Components (Chemical Name)/ REACH Registration No.	Concentration	EC No./ EC Index No.	GHS Classification
33213-65-9 RB9875200	.beta.-Endosulfan	100.0 %	625-635-6 NA	Acute Tox.(O) 3: H301 Aquatic (A) 1: H400

Section 4. First Aid Measures

4.1 Description of First Aid Measures:

In Case of Inhalation: Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Get immediate medical attention.

In Case of Skin Contact: Immediately wash skin with soap and plenty of water for at least 15 minutes. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.

In Case of Eye Contact: Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Have eyes examined and tested by medical personnel.

In Case of Ingestion: Wash out mouth with water provided person is conscious. Never give anything by mouth to an unconscious person. Get medical attention. Do NOT induce vomiting unless directed to do so by medical personnel.

Section 5. Fire Fighting Measures

5.1 Suitable Extinguishing Media: Use alcohol-resistant foam, carbon dioxide, water, or dry chemical spray.
Use water spray to cool fire-exposed containers.

Unsuitable Extinguishing Media: A solid water stream may be inefficient.

5.2 Flammable Properties and Hazards: No data available.

No data available.

Flash Pt: No data.

Explosive Limits: LEL: No data. UEL: No data.

Autoignition Pt: No data.

5.3 Fire Fighting Instructions: As in any fire, wear self-contained breathing apparatus pressure-demand (NIOSH approved or equivalent), and full protective gear to prevent contact with skin and eyes.

Section 6. Accidental Release Measures

6.1 Protective Precautions, Protective Equipment and Emergency Procedures: Avoid raising and breathing dust, and provide adequate ventilation. As conditions warrant, wear a NIOSH approved self-contained breathing apparatus, or respirator, and appropriate personal protection (rubber boots, safety goggles, and heavy rubber gloves).

6.2 Environmental Precautions: Take steps to avoid release into the environment, if safe to do so.

6.3 Methods and Material For Containment and Cleaning Up: Contain spill and collect, as appropriate. Transfer to a chemical waste container for disposal in accordance with local regulations.

Section 7. Handling and Storage

7.1 Precautions To Be Taken in Handling: Avoid breathing dust/fume/gas/mist/vapours/spray. Avoid prolonged or repeated exposure.

7.2 Precautions To Be Taken in Storing: Keep container tightly closed. Store in accordance with information listed on the product insert.

Section 8. Exposure Controls/Personal Protection

8.1 Exposure Parameters:

8.2 Exposure Controls:

8.2.1 Engineering Controls (Ventilation etc.): Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

8.2.2 Personal protection equipment:

Eye Protection: Safety glasses

Protective Gloves: Compatible chemical-resistant gloves

Other Protective Clothing: Lab coat

Respiratory Equipment (Specify Type): NIOSH approved respirator, as conditions warrant.

Work/Hygienic/Maintenance Practices: Do not take internally. Facilities storing or utilizing this material should be equipped with an eyewash and a safety shower. Wash thoroughly after handling.

No data available.

Section 9. Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties

Physical States:	[ ] Gas [ ] Liquid [X] Solid
Appearance and Odor:	A solid
pH:	No data.
Melting Point:	No data.
Boiling Point:	No data.
Flash Pt:	No data.
Evaporation Rate:	No data.
Flammability (solid, gas):	No data available.
Explosive Limits:	LEL: No data. UEL: No data.
Vapor Pressure (vs. Air or mm Hg):	No data.
Vapor Density (vs. Air = 1):	No data.

	Specific Gravity (Water = 1):	No data.
	Solubility in Water:	No data.
	Solubility Notes:	Soluble (slightly) in: chloroform; MeOH;
	Octanol/Water Partition Coefficient:	No data.
	Autoignition Pt:	No data.
	Decomposition Temperature:	No data.
	Viscosity:	No data.
9.2	**Other Information**	
	Percent Volatile:	No data.
	Molecular Formula & Weight:	C9H6Cl6O3S 406.9

Section 10. Stability and Reactivity

10.1	**Reactivity:**	No data available.
10.2	**Stability:**	Unstable [ ] Stable [X]
10.3	**Stability Note(s):**	Stable if stored in accordance with information listed on the product insert.
	Polymerization:	Will occur [ ] Will not occur [X]
10.4	**Conditions To Avoid:**	No data available.
10.5	**Incompatibility - Materials To Avoid:**	strong oxidizing agents
10.6	**Hazardous Decomposition or Byproducts:**	carbon dioxide carbon monoxide hydrogen chloride gas sulfur oxides

Section 11. Toxicological Information

11.1	**Information on Toxicological Effects:**	The toxicological effects of this product have not been thoroughly studied. Endosulfan II - Toxicity Data: Oral LD50 (rat): 240 mg/kg;
	Chronic Toxicological Effects:	Endosulfan II - Investigated as an agricultural chemical and mutagen. Only select Registry of Toxic Effects of Chemical Substances (RTECS) data is presented here. See actual entry in RTECS for complete information. Endosulfan II RTECS Number: RB9875200

CAS #	Hazardous Components (Chemical Name)	NTP	IARC	ACGIH	OSHA
33213-65-9	.beta.-Endosulfan	n.a.	n.a.	n.a.	n.a.

Section 12. Ecological Information

12.1	**Toxicity:**	Avoid release into the environment. Runoff from fire control or dilution water may cause pollution.
12.2	**Persistence and Degradability:**	No data available.
12.3	**Bioaccumulative Potential:**	No data available.
12.4	**Mobility in Soil:**	No data available.
12.5	**Results of PBT and vPvB assessment:**	No data available.
12.6	**Other adverse effects:**	No data available.

Section 13. Disposal Considerations

13.1 Waste Disposal Method: Dispose in accordance with local, state, and federal regulations.

Section 14. Transport Information

14.1 LAND TRANSPORT (US DOT):

DOT Proper Shipping Name: Toxic solid, organic, n.o.s. (Endosulfan II)
DOT Hazard Class: 6.1 POISON
UN/NA Number: UN2811 **Packing Group:** II

14.1 LAND TRANSPORT (European ADR/RID):

ADR/RID Shipping Name: Toxic solid, organic, n.o.s. (Endosulfan II)
UN Number: 2811 **Packing Group:** II
Hazard Class: 6.1 - POISON

14.3 AIR TRANSPORT (ICAO/IATA):

ICAO/IATA Shipping Name: Toxic solid, organic, n.o.s. (Endosulfan II)
UN Number: 2811 **Packing Group:** II
Hazard Class: 6.1 - POISON **IATA Classification:** 6.1

Additional Transport Information: Transport in accordance with local, state, and federal regulations.
When sold in quantities of less than or equal to 1 mL, or 1 g, with an Excepted Quantity Code of E1, E2, E4, or E5, this item meets the De Minimis Quantities exemption, per IATA 2.6.10. Therefore packaging does not have to be labeled as Dangerous Goods/Excepted Quantity.

Section 15. Regulatory Information

EPA SARA (Superfund Amendments and Reauthorization Act of 1986) Lists

CAS #	Hazardous Components (Chemical Name)	S. 302 (EHS)	S. 304 RQ	S. 313 (TRI)
33213-65-9	.beta.-Endosulfan	No	Yes 1 LB	No

CAS #	Hazardous Components (Chemical Name)	Other US EPA or State Lists
33213-65-9	.beta.-Endosulfan	CAA HAP,ODC: No; CWA NPDES: Yes; TSCA: Yes - Inventory; CA PROP.65: No

Regulatory Information Statement: This SDS was prepared in accordance with 29 CFR 1910.1200 and Regulation (EC) No.1272/2008.

Section 16. Other Information

Revision Date: 06/16/2018

Additional Information About This Product: No data available.

Company Policy or Disclaimer: DISCLAIMER: This information is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.

SAFETY DATA SHEET
Endosulfan sulfate

Revision: 06/09/2018

according to Regulation (EC) No. 1907/2006 as amended by (EC) No. 1272/2008

Section 1. Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product Code: 24255

Product Name: Endosulfan sulfate

Synonyms: 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano-2,4,3-benzodioxathiepin, 3,3-dioxide;

1.2 Relevant identified uses of the substance or mixture and uses advised against:

Relevant identified uses: For research use only, not for human or veterinary use.

1.3 Details of the Supplier of the Safety Data Sheet:

Company Name: Cayman Chemical Company
1180 E. Ellsworth Rd.
Ann Arbor, MI 48108

Web site address: www.caymanchem.com

Information: Cayman Chemical Company +1 (734)971-3335

1.4 Emergency telephone number:

Emergency Contact: CHEMTREC Within USA and Canada: +1 (800)424-9300
CHEMTREC Outside USA and Canada: +1 (703)527-3887

Section 2. Hazards Identification

2.1 Classification of the Substance or Mixture:

Acute Toxicity: Oral, Category 2

Aquatic Toxicity (Acute), Category 1

2.2 Label Elements:

GHS Signal Word: **Danger**

GHS Hazard Phrases:

H300: Fatal if swallowed.

H400: Very toxic to aquatic life.

GHS Precaution Phrases:

P264: Wash {hands} thoroughly after handling.

P273: Avoid release to the environment.

GHS Response Phrases:

P301+310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.

P330: Rinse mouth.

P391: Collect spillage.

GHS Storage and Disposal Phrases:

Please refer to Section 7 for Storage and Section 13 for Disposal information.

2.3 Adverse Human Health Effects and Symptoms: Fatal if swallowed.
Material may be irritating to the mucous membranes and upper respiratory tract.
May be harmful by inhalation or skin absorption.
May cause eye, skin, or respiratory system irritation.
Very toxic to aquatic life.
To the best of our knowledge, the toxicological properties have not been thoroughly investigated.

Section 3. Composition/Information on Ingredients

CAS # / RTECS #	Hazardous Components (Chemical Name)/ REACH Registration No.	Concentration	EC No./ EC Index No.	GHS Classification
1031-07-8 RB9150000	Endosulfan sulfate	100.0 %	623-765-8 NA	Acute Tox.(O) 2: H300 Aquatic (A) 1: H400

Section 4. First Aid Measures

4.1 Description of First Aid Measures:

In Case of Inhalation: Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Get immediate medical attention.

In Case of Skin Contact: Immediately wash skin with soap and plenty of water for at least 15 minutes. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.

In Case of Eye Contact: Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Have eyes examined and tested by medical personnel.

In Case of Ingestion: Wash out mouth with water provided person is conscious. Never give anything by mouth to an unconscious person. Get medical attention. Do NOT induce vomiting unless directed to do so by medical personnel.

Section 5. Fire Fighting Measures

5.1 Suitable Extinguishing Media: Use alcohol-resistant foam, carbon dioxide, water, or dry chemical spray.
Use water spray to cool fire-exposed containers.

Unsuitable Extinguishing Media: A solid water stream may be inefficient.

5.2 Flammable Properties and Hazards: No data available.

No data available.

Flash Pt: No data.

Explosive Limits: LEL: No data. UEL: No data.

Autoignition Pt: No data.

5.3 Fire Fighting Instructions: As in any fire, wear self-contained breathing apparatus pressure-demand (NIOSH approved or equivalent), and full protective gear to prevent contact with skin and eyes.

Section 6. Accidental Release Measures

6.1 Protective Precautions, Protective Equipment and Emergency Procedures: Avoid raising and breathing dust, and provide adequate ventilation. As conditions warrant, wear a NIOSH approved self-contained breathing apparatus, or respirator, and appropriate personal protection (rubber boots, safety goggles, and heavy rubber gloves).

6.2 Environmental Precautions: Take steps to avoid release into the environment, if safe to do so.

6.3 Methods and Material For Containment and Cleaning Up: Contain spill and collect, as appropriate. Transfer to a chemical waste container for disposal in accordance with local regulations.

Section 7. Handling and Storage

7.1 Precautions To Be Taken in Handling: Avoid breathing dust/fume/gas/mist/vapours/spray. Avoid prolonged or repeated exposure.

7.2 Precautions To Be Taken in Storing: Keep container tightly closed. Store in accordance with information listed on the product insert.

Section 8. Exposure Controls/Personal Protection

8.1 Exposure Parameters:

8.2 Exposure Controls:

8.2.1 Engineering Controls (Ventilation etc.): Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

8.2.2 Personal protection equipment:

Eye Protection: Safety glasses

Protective Gloves: Compatible chemical-resistant gloves

Other Protective Clothing: Lab coat

Respiratory Equipment (Specify Type): NIOSH approved respirator, as conditions warrant.

Work/Hygienic/Maintenance Practices: Do not take internally. Facilities storing or utilizing this material should be equipped with an eyewash and a safety shower. Wash thoroughly after handling.

No data available.

Section 9. Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties

Physical States:	[ ] Gas [ ] Liquid [X] Solid
Appearance and Odor:	A solid
pH:	No data.
Melting Point:	No data.
Boiling Point:	No data.
Flash Pt:	No data.
Evaporation Rate:	No data.
Flammability (solid, gas):	No data available.
Explosive Limits:	LEL: No data. UEL: No data.
Vapor Pressure (vs. Air or mm Hg):	No data.
Vapor Density (vs. Air = 1):	No data.

	Specific Gravity (Water = 1):	No data.
	Solubility in Water:	No data.
	Solubility Notes:	Soluble (slightly) in: DMSO; MeOH;
	Octanol/Water Partition Coefficient:	No data.
	Autoignition Pt:	No data.
	Decomposition Temperature:	No data.
	Viscosity:	No data.
9.2	**Other Information**	
	Percent Volatile:	No data.
	Molecular Formula & Weight:	C9H6Cl6O4S 422.9

Section 10. Stability and Reactivity

10.1	**Reactivity:**	No data available.
10.2	**Stability:**	Unstable [ ] Stable [X]
10.3	**Stability Note(s):**	Stable if stored in accordance with information listed on the product insert.
	Polymerization:	Will occur [ ] Will not occur [X]
10.4	**Conditions To Avoid:**	No data available.
10.5	**Incompatibility - Materials To Avoid:**	strong oxidizing agents
10.6	**Hazardous Decomposition or Byproducts:**	carbon dioxide carbon monoxide hydrogen chloride sulfur oxides

Section 11. Toxicological Information

11.1	**Information on Toxicological Effects:**	The toxicological effects of this product have not been thoroughly studied. Endosulfan sulfate - Toxicity Data: Oral LD50 (rat): 18 mg/kg;
	Chronic Toxicological Effects:	Endosulfan sulfate - Investigated as an agricultural chemical and mutagen. Only select Registry of Toxic Effects of Chemical Substances (RTECS) data is presented here. See actual entry in RTECS for complete information. Endosulfan sulfate RTECS Number: RB9150000

CAS #	Hazardous Components (Chemical Name)	NTP	IARC	ACGIH	OSHA
1031-07-8	Endosulfan sulfate	n.a.	n.a.	n.a.	n.a.

Section 12. Ecological Information

12.1	**Toxicity:**	Avoid release into the environment. Runoff from fire control or dilution water may cause pollution.
12.2	**Persistence and Degradability:**	No data available.
12.3	**Bioaccumulative Potential:**	No data available.
12.4	**Mobility in Soil:**	No data available.
12.5	**Results of PBT and vPvB assessment:**	No data available.
12.6	**Other adverse effects:**	No data available.

Section 13. Disposal Considerations

13.1 Waste Disposal Method: Dispose in accordance with local, state, and federal regulations.

Section 14. Transport Information

14.1 LAND TRANSPORT (US DOT):

DOT Proper Shipping Name: Toxic solid, organic, n.o.s. (Endosulfan sulfate)
DOT Hazard Class: 6.1 POISON
UN/NA Number: UN2811 **Packing Group:** II

14.1 LAND TRANSPORT (European ADR/RID):

ADR/RID Shipping Name: Toxic solid, organic, n.o.s. (Endosulfan sulfate)
UN Number: 2811 **Packing Group:** II
Hazard Class: 6.1 - POISON

14.3 AIR TRANSPORT (ICAO/IATA):

ICAO/IATA Shipping Name: Toxic solid, organic, n.o.s. (Endosulfan sulfate)
UN Number: 2811 **Packing Group:** II
Hazard Class: 6.1 - POISON **IATA Classification:** 6.1

Additional Transport Information: Transport in accordance with local, state, and federal regulations.
When sold in quantities of less than or equal to 1 mL, or 1 g, with an Excepted Quantity Code of E1, E2, E4, or E5, this item meets the De Minimis Quantities exemption, per IATA 2.6.10. Therefore packaging does not have to be labeled as Dangerous Goods/Excepted Quantity.

Section 15. Regulatory Information

EPA SARA (Superfund Amendments and Reauthorization Act of 1986) Lists

CAS #	Hazardous Components (Chemical Name)	S. 302 (EHS)	S. 304 RQ	S. 313 (TRI)
1031-07-8	Endosulfan sulfate	No	Yes 1 LB	No

CAS #	Hazardous Components (Chemical Name)	Other US EPA or State Lists
1031-07-8	Endosulfan sulfate	CAA HAP,ODC: No; CWA NPDES: Yes; TSCA: No; CA PROP.65: No

Regulatory Information Statement: This SDS was prepared in accordance with 29 CFR 1910.1200 and Regulation (EC) No.1272/2008.

Section 16. Other Information

Revision Date: 06/09/2018

Additional Information About This Product: No data available.

Company Policy or Disclaimer: DISCLAIMER: This information is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.

AccuStandard, Inc.
125 Market St., New Haven, CT 06513 USA
Tel: 203-786-5290 Fax: 203-786-5287

SAFETY DATA SHEET

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

1.1 - Product Identifiers

Catalog Name: P-146N

Description: Endrin ketone

CAS No.: 53494-70-5

1.2 - Relevant Identified Uses of the Substance or Mixture

Laboratory Chemical Reference Material

1.3 - Supplier Details

Company: AccuStandard, Inc.
125 Market St.
New Haven, CT 06513 USA

Telephone Number: 203-786-5290

Fax: 203-786-5287

Email: edocs@accustandard.com

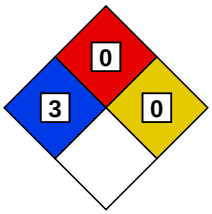
1.4 - Emergency Telephone Number

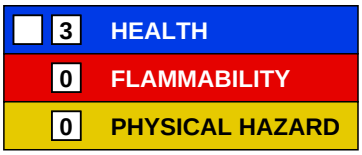
Emergency Phone #: AccuStandard, Inc.
1-203-502-7070 (USA)
+001-203-502-7070 (International)

24 hours / 7 days a week

SECTION 2 - HAZARDS IDENTIFICATION

2.1 - GHS Label Elements





Signal Word: Danger

Hazard Codes:

H300 - May be fatal if swallowed. (Acute toxicity, oral, category 2)

H315 - Irritating to skin. (Skin corrosion/irritation, category 2)

H320 - Irritating to eyes. (Eye damage/irritation, category 2B)

H335 - May be irritating to mucous membrane and upper respiratory system. (Specific target organ toxicity, single exposure; Respiratory tract irritation, category 3)

Precautionary Codes:

P202 - This product should only by used by persons trained in the safe handling of hazardous chemicals.

P233 - Store in a tightly closed container. (P404)

P235 - Store in a cool dry place.

P262 - Do not get in eyes, on skin or clothing.

SECTION 2 - HAZARDS IDENTIFICATION *- continued*

2.1 - GHS Label Elements *- continued*

P264 - Wash thoroughly after handling. Do not take internally. Eye wash and safety equipment should be readily available.

P280 - Protective gloves must be worn to prevent skin contact.

P284 - Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), or a risk assessment shows air-purifying respirators are appropriate, use of a NIOSH/MSHA approved air supplied respirator is advised. Use a full-face respirator with multi-purpose combination (US) or type ABEK (EN14387) respirator cartridges in absence of proper environmental control. Always use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Engineering and/or administrative controls should be implemented to reduce exposure.

P338 - Eye contact: Immediately flush with plenty of water. After initial flushing, remove and contact lenses and continue flushing for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers.

P360 - Skin contact: Immediately wash skin with soap and plenty of water. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.

2.2 - Other Hazards

2.2.1 - Symptom of Exposure Health/Environment

TOXIC.

Exposure can cause headache, nausea, confusion, drowsiness, dizziness and/or vomiting.

Hypersensitivity to stimulation, sensation of prickling, tingling or creeping on skin.

May cause incoordination, tremor, mental confusion and hyper-excitable state.

Overexposure by any route to chlorinated insecticides may cause headache, nausea, vomiting, nervousness and hyperactivity, unusual sensations and fatigue. Convulsions and coma may follow.

2.2.2 - Potential Health Effects

Irritating to eyes. (Eye damage/irritation, category 2B)

Irritating to skin. (Skin corrosion/irritation, category 2)

May be harmful if absorbed through the skin. (Acute toxicity, dermal, category 5)

May be irritating to mucous membrane and upper respiratory system. (Specific target organ toxicity, single exposure; Respiratory tract irritation, category 3)

May be harmful if inhaled. (Acute toxicity, inhalation, category 5)

May be fatal if swallowed. (Acute toxicity, oral, category 2)

2.2.3 - Routes of Entry

Inhalation, ingestion or skin contact.

2.2.4 - Carcinogenicity

This product is or contains a component that is not listed (ACGIH, IARC, NTP, OSHA) as a cancer causing agent.

SECTION 3 - COMPOSITION / ANALYTES DATA

Description: Endrin ketone

Synonyms: Hexachloro-decahydro-metheno-3H-cyclopenta(a)pentalene-3-one

Molecular Weight: 380.91

Molecular Formula: C12H8Cl6O

			ACGIH -TLV (mg/m³)			OSHA -PEL (mg/m³)		
Analyte	CAS #	% Concentration	TWA	STEL	Skin	TWA	STEL	Skin
Endrin ketone	53494-70-5	100.000						

SECTION 4 - FIRST AID MEASURES

4.1 - First Aid Procedures - General

Get medical assistance for all cases of overexposure.

4.2 - Eye Contact

Eye contact: Immediately flush with plenty of water. After initial flushing, remove and contact lenses and continue flushing for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. (P338)

4.3 - Skin Contact

Skin contact: Immediately wash skin with soap and plenty of water. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse. (P360)

4.4 - Inhalation

Inhalation: Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Seek immediate medical attention.

4.5 - Ingestion

Ingestion: Call a physician or poison control center immediately. ONLY induce vomiting at the instructions of a physician. Never give anything by mouth to an unconscious person.

SECTION 5 - FIRE FIGHTING MEASURES

5.1 - Flammable Properties

During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

5.2 - Extinguishing Media

Use alcohol foam, carbon dioxide, dry chemical, or water spray when fighting fires involving this material.

5.3 - Protection of Firefighters

As in any fire, wear self-contained breathing apparatus pressure demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

6.1 - Spill Response

Wear suitable protective equipment listed under Exposure Controls / Personal Protection. Eliminate any ignition sources until the area is determined to be free from explosion or fire hazards. Contain the release and eliminate its source, if this can be done without risk. Dispose as hazardous waste. Comply with Federal, State and local regulations.

SECTION 7 - HANDLING AND STORAGE

Store in a tightly closed container. (P404)

Store in a cool dry place. (P235)

Avoid inhalation.

Use with adequate ventilation.

Do not get in eyes, on skin or clothing. (P262)

Avoid prolonged or repeated exposure.

This product should only by used by persons trained in the safe handling of hazardous chemicals. (P202)

SECTION 8 - EXPOSURE CONTROLS

8.1 - Engineering Controls/PPE

Wash thoroughly after handling. Do not take internally. Eye wash and safety equipment should be readily available. (P264)

8.2 - General Hygene Considerations

Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), or a risk assessment shows air-purifying respirators are appropriate, use of a NIOSH/MSHA approved air supplied respirator is advised. Use a full-face respirator with multi-purpose combination (US) or type ABEK (EN14387) respirator cartridges in absence of proper environmental control. Always use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Engineering and/or administrative controls should be implemented to reduce exposure.

Material must be handled or transferred in an approved fume hood or with equivalent ventilation.

Protective gloves must be worn to prevent skin contact. (P280)

(Butyl, viton or equivalent)

Use eye protection tested and approved under the appropriate government standards such as NIOSH (US) or EN 166 (EU).

All recommendations are advisory only and must be evaluated by an industrial hygienist and/or safety officer familiar with the specific situation of anticipated use, such as concentration and amount of the substance in the workplace. Any recommendation should not be construed as offering an approval for any specific use of the product.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Crystalline solid

Odor: N/A

Odor Threshold: N/A

pH: N/A

Melting Point: 143 - 144 °C

Boiling Point: 351 - 352 °C

Flash Point: 378 °F / 192 °C

Evaporation Rate (Butyl Acetate=1): N/A

Flammability Class: N/A

Lower Flammability Level: N/A

Upper Flammability Level: N/A

Vapor Pressure: N/A

Vapor Density (Air = 1): N/A

Specific Gravity: 1.87 g/cm3

Solubility in Water: 0.22 mg/L

Partition Coefficient: log Kow: 4.99

Autoignition Temperature: N/A

Decomposition Temperature: N/A

Viscosity: N/A

VOC Content: N/A

Percent Volatile: N/A

SECTION 10 - STABILITY AND REACTIVITY

Stability: Stable

Materials to Avoid: Acids
Bases
Oxidizers

Hazardous Decomposition: Oxides of carbon; Hydrogen chloride gas

Hazardous Polymerization: Will not occur

Condition to Avoid: Excessive heat

SECTION 11 - TOXICOLOGICAL INFORMATION

Human Health Toxicity

See section 2 for specific toxicological information for the ingredients of this product.

LD50 (Oral): Rat - 10 mg/kg

LD50 (Dermal) : N/A

LC50 (Inhalation): N/A

No other information related to the toxicological properties of this product is available at this time.

SECTION 12 - ECOLOGICAL INFORMATION

Environmental Toxicity

By complying with sections 6 and 7 there should be no release to the environment.

LC50 (Fish): N/A

EC50 (Aquatic Invertebrate): N/A

BCF: N/A

No other information related to the ecological properties of this product is available at this time.

SECTION 13 - DISPOSAL CONSIDERATIONS

Recycle or incinerate at any EPA approved facility or dispose in compliance with Federal, State and local regulations. Empty containers must be triple-rinsed prior to disposal.

SECTION 14 - TRANSPORT INFORMATION

Transportation Information (DOT/IATA)

UN Number: UN2811

Class: 6.1

Packing Group: II

Proper Shipping Name: Toxic solid, organic, n.o.s. (Endrin ketone)

Poison by Inhalation: No

Marine Pollutant: No

SECTION 15 - REGULATORY INFORMATION

This product is NOT subject to SARA section 313 reporting requirements.

The CAS number of this product is NOT listed on the TSCA Inventory.

For laboratory, research and development use only. Not for manufacturing or commercial purposes.

SECTION 15 - REGULATORY INFORMATION *- continued*

In addition to federal and state regulations, local regulations may apply. Check with your local regulatory authorities.

SECTION 16 - OTHER INFORMATION

This document has been designed to meet the requirements of OSHA, ANSI, GHS and CHIPs regulations. Chemicals are classified using the Globally Harmonized System for Classification and Labeling of Chemicals.

The statements contained herein are offered for informational purposes only and are based on technical data that we believe to be accurate. The manufacturer will not assume any liability for the accuracy and completeness of this information. Final determination of the suitability of the material is the responsibility of the user. Although certain hazards are described herein, the user should not presume that these are the only hazards that exist. Since conditions and manner of use are outside of the manufacturers control, we make

NO WARRANTY OF MERCHANTABILITY, EXPRESSED OR IMPLIED, AND ASSUME NO LIABILITY RESULTING FROM ITS USE.

Legend : N/A = Not Available ND = Not Determined NR = Not Regulated

HMIS/NFPA HAZARD INDEX

0 - Minimal
1 - Slight
2 - Moderate
3 - Serious
4 - Severe

* - Additional Hazard

GHS HAZARD INDEX

Category 1 - Most Severe
Category 5 - Least Severe

**** End of Document ****

ENDRIN	ICSC: 1023 (March 2000)

CAS #: 72-20-8
UN #: 2761
EC Number: 200-775-7

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media.

PREVENT DISPERSION OF DUST! STRICT HYGIENE! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	See Ingestion.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! See Ingestion.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes		Wear face shield or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Dizziness. Weakness. Headache. Nausea. Vomiting. Convulsions.	Do not eat, drink, or smoke during work. Wash hands before eating.	Give a slurry of activated charcoal in water to drink. Rest. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT wash away into sewer.

STORAGE

Separated from food and feedstuffs. Well closed. Keep in a well-ventilated room. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing.

PACKAGING

Do not transport with food and feedstuffs.
Severe marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: I

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

ENDRIN **ICSC: 1023**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
WHITE CRYSTALS.

Physical dangers

Chemical dangers
Decomposes above 245°C . This produces hydrogen chloride and phosgene.

Formula: $C_{12}H_8Cl_6O$
Molecular mass: 380.9
Decomposes at 245°C
Melting point: 200°C
Density: 1.7 g/cm³
Solubility in water at 25°C: none
Vapour pressure at 25°C: negligible
Octanol/water partition coefficient as log Pow: 5.34

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Effects of short-term exposure
The substance may cause effects on the central nervous system. This may result in convulsions and death. The effects may be delayed. Medical observation is indicated.

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying or when dispersed, especially if powdered.

Effects of long-term or repeated exposure

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.1 mg/m^3, as TWA; (skin); A4 (not classifiable as a human carcinogen).
MAK: (inhalable fraction): 0.05 mg/m^3; peak limitation category: II(8); skin absorption (H); pregnancy risk group: C

ENVIRONMENT

The substance is very toxic to aquatic organisms. This substance may be hazardous to the environment. Special attention should be given to bees, birds and mammals. It is strongly advised not to let the chemical enter into the environment because it is persistent. Bioaccumulation of this chemical may occur in fish and seafood. Avoid release to the environment in circumstances different to normal use.

NOTES

If the substance is formulated with solvent(s) also consult the card(s) (ICSC) of the solvent(s).
Carrier solvents used in commercial formulations may change physical and toxicological properties.
Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification
Symbol: T+, N; R: 24-28-50/53; S: (1/2)-22-36/37-45-60-61

LINDANE **ICSC: 0053 (November 2016)**

gamma-1,2,3,4,5,6-Hexachlorocyclohexane
gamma-BHC
gamma-HCH

CAS #: 58-89-9
UN #: 2761
EC Number: 200-401-2

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire. Risk of fire and explosion if formulations contain flammable/explosive solvents.		In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

AVOID ALL CONTACT! AVOID EXPOSURE OF BREASTFEEDING WOMEN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Cough. Sore throat. Further see Ingestion.	Avoid inhalation of dust.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Wear protective gloves when administering first aid. Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes	Redness.	Wear face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Nausea. Vomiting. Diarrhoea. Headache. Dizziness. Tremor. Convulsions.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink, but NOT if convulsions occur. Refer immediately for medical attention. Rest.

SPILLAGE DISPOSAL

Personal protection: filter respirator for organic gases and particulates adapted to the airborne concentration of the substance, chemical protection suit including self-contained breathing apparatus and protective gloves. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable non-metallic containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Well closed. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing. Separated from bases and food and feedstuffs.

PACKAGING

Do not transport with food and feedstuffs.
Severe marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

DANGER

Toxic if swallowed or in contact with skin
Harmful if inhaled
May cause cancer
May cause harm to breast-fed children
Causes damage to the nervous system, the bone marrow and the liver through prolonged or repeated exposure
Very toxic to aquatic life with long lasting effects

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: III

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

LINDANE **ICSC: 0053**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
WHITE CRYSTALLINE POWDER.

Physical dangers
No data.

Chemical dangers
Decomposes on heating and on burning. This produces toxic and corrosive fumes including chlorine (see ICSC 0126), hydrogen chloride (see ICSC 0163) and phosgene (see ICSC 0007). Reacts with bases. This produces toxic and corrosive fumes including hydrogen chloride and trichlorobenzenes (see ICSCs 0344, 1049 and 1222).

Formula: $C_6H_6Cl_6$
Molecular mass: 290.8
Boiling point: 323°C
Melting point: 113°C
Density: 1.9 g/cm³
Solubility in water, g/100ml at 20°C: 0.0007 (very poor)
Vapour pressure, Pa at 20°C: 0.0012
Relative density of the vapour/air-mixture at 20°C (air = 1): 1
Octanol/water partition coefficient as log Pow: 3.61 - 3.72

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

Effects of short-term exposure
The substance may cause effects on the central nervous system. This may result in convulsions. Exposure could cause death. Medical observation is indicated.

Inhalation risk
A harmful concentration of airborne particles can be reached quickly when dispersed.

Effects of long-term or repeated exposure
The substance may have effects on the nervous system, bone marrow and liver. This substance is carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.5 mg/m^3, as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).

MAK: (inhalable fraction): 0.1 mg/m^3; peak limitation category: II(8); skin absorption (H); carcinogen category: 4; pregnancy risk group: C

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur along the food chain, for example in fish and seafood. The substance may cause long-term effects in the aquatic environment. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Carrier solvents used in commercial formulations may change physical and toxicological properties.
Do NOT take working clothes home.
Do NOT use in the vicinity of a fire or a hot surface, or during welding.
See ICSCs 0487, 0795 and 0796.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 20/21-25-48/22-64-50/53; S: (1/2)-36/37-45-60-61

AccuStandard, Inc.
125 Market St., New Haven, CT 06513 USA
Tel: 203-786-5290 Fax: 203-786-5287

SAFETY DATA SHEET

Emergency Contact Information:

AccuStandard, Inc.
1-203-786-5290

Hours: Monday to Friday 8:00am to 5:00pm EST

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

1.1 - Product Identifiers

Catalog Name: P-054N

Description: Heptachlor epoxide (Isomer B)

CAS No.: 1024-57-3

1.2 - Relevant Identified Uses of the Substance or Mixture

Laboratory Chemical Reference Material

1.3 - Supplier Details

Company: AccuStandard, Inc.
125 Market St.
New Haven, CT 06513 USA

Telephone Number: 203-786-5290

Fax: 203-786-5287

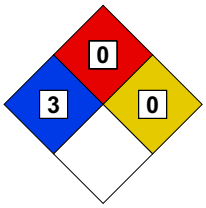
Email: edocs@accustandard.com

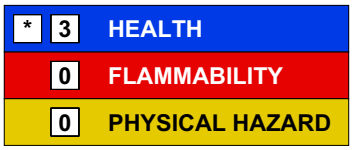
1.4 - Emergency Telephone Number

Emergency Phone #: AccuStandard, Inc.
1-203-786-5290
Hours: Monday to Friday 8:00am to 5:00pm EST

SECTION 2 - HAZARDS IDENTIFICATION

2.1 - GHS Label Elements





Signal Word: Danger

Hazard Codes:

H301 - Toxic if swallowed. (Acute toxicity, oral, category 3)

H312 - Harmful if absorbed through skin. (Acute toxicity, dermal, category 4)

H350 - This product is or contains a component that is classified (ACGIH, IARC, NTP, OSHA) as a possible cancer hazard. (Carcinogenicity, category 1B)

Precautionary Codes:

P202 - This product should only by used by persons trained in the safe handling of hazardous chemicals.

P262 - Do not get in eyes, on skin or clothing.

P264 - Wash thoroughly after handling. Do not take internally. Eye wash and safety equipment should be readily available.

P280 - Protective gloves must be worn to prevent skin contact.

SECTION 2 - HAZARDS IDENTIFICATION - *continued*

2.1 - GHS Label Elements - *continued*

P284 - Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), or a risk assessment shows air-purifying respirators are appropriate, use of a NIOSH/MSHA approved air supplied respirator is advised. Use a full-face respirator with multi-purpose combination (US) or type ABEK (EN14387) respirator cartridges in absence of proper environmental control. Always use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Engineering and/or administrative controls should be implemented to reduce exposure.

P338 - Eye contact: Immediately flush with plenty of water. After initial flushing, remove and contact lenses and continue flushing for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers.

P360 - Skin contact: Immediately wash skin with soap and plenty of water. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.

P404 - Store in a tightly closed container.

2.2 - Other Hazards

2.2.1 - Symptom of Exposure Health/Environment

Suspected endocrine toxicant: May cause diseases such as hypothyroidism, diabetes mellitus, hypoglycemia, reproductive disorders, and cancer.

Hypersensitivity to stimulation, sensation of prickling, tingling or creeping on skin.

May cause incoordination, tremor, mental confusion and hyper-excitable state.

Overexposure by any route to chlorinated insecticides may cause headache, nausea, vomiting, nervousness and hyperactivity, unusual sensations and fatigue. Convulsions and coma may follow.

Bioaccumulation of this chemical may occur. It is strongly advised that this substance does not enter the environment.

2.2.2 - Potential Health Effects

May be irritating to eyes.

May be irritating to skin.

Harmful if absorbed through skin. (Acute toxicity, dermal, category 4)

Readily absorbed through skin.

Irritating to mucous membrane and upper respiratory system.

May be harmful if inhaled. (Acute toxicity, inhalation, category 5)

Toxic if swallowed. (Acute toxicity, oral, category 3)

2.2.3 - Routes of Entry

Inhalation, ingestion or skin contact.

2.2.4 - Carcinogenicity

California Proposition 65 cancer hazard.

This product is or contains a component that is classified (ACGIH, IARC, NTP, OSHA) as a possible cancer hazard. (Carcinogenicity, category 1B)

SECTION 3 - COMPOSITION / ANALYTES DATA

Description: Heptachlor epoxide (Isomer B)

Synonyms: N/A

Molecular Weight: 389.30

Molecular Formula: C10H5Cl7O

EC#: 213-831-0

Index#: 602-063-00-5

SECTION 3 - COMPOSITION / ANALYTES DATA *- continued*

Analyte	CAS Number	% Concentration	ACGIH -TLV (mg/m³)			OSHA -PEL (mg/m³)		
			TWA	STEL	Skin	TWA	STEL	Skin
Heptachlor epoxide (Isomer B)	1024-57-3	100.000	0.05		X			

SECTION 4 - FIRST AID MEASURES

4.1 - First Aid Procedures - General

Get medical assistance for all cases of overexposure.

4.2 - Eye Contact

Eye contact: Immediately flush with plenty of water. After initial flushing, remove and contact lenses and continue flushing for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. (P338)

4.3 - Skin Contact

Skin contact: Immediately wash skin with soap and plenty of water. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse. (P360)

4.4 - Inhalation

Inhalation: Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Seek immediate medical attention.

4.5 - Ingestion

Ingestion: Call a physician or poison control center immediately. ONLY induce vomiting at the instructions of a physician. Never give anything by mouth to an unconscious person.

SECTION 5 - FIRE FIGHTING MEASURES

5.1 - Flammable Properties

During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

5.2 - Extinguishing Media

Use alcohol foam, carbon dioxide, dry chemical, or water spray when fighting fires involving this material.

5.3 - Protection of Firefighters

As in any fire, wear self-contained breathing apparatus pressure demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

6.1 - Spill Response

Wear suitable protective equipment listed under Exposure Controls / Personal Protection. Eliminate any ignition sources until the area is determined to be free from explosion or fire hazards. Contain the release and eliminate its source, if this can be done without risk. Dispose as hazardous waste. Comply with Federal, State and local regulations.

SECTION 7 - HANDLING AND STORAGE

Store in a tightly closed container. (P404)

Avoid inhalation.

Use with adequate ventilation.

Do not get in eyes, on skin or clothing. (P262)

SECTION 7 - HANDLING AND STORAGE *- continued*

Avoid prolonged or repeated exposure.

This product should only by used by persons trained in the safe handling of hazardous chemicals. (P202)

Keep refrigerated.

SECTION 8 - EXPOSURE CONTROLS

8.1 - Engineering Controls/PPE

Wash thoroughly after handling. Do not take internally. Eye wash and safety equipment should be readily available. (P264)

8.2 - General Hygene Considerations

Respiratory Protection: If workplace exposure limit(s) of product or any component is exceeded (see TLV/PEL), or a risk assessment shows air-purifying respirators are appropriate, use of a NIOSH/MSHA approved air supplied respirator is advised. Use a full-face respirator with multi-purpose combination (US) or type ABEK (EN14387) respirator cartridges in absence of proper environmental control. Always use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Engineering and/or administrative controls should be implemented to reduce exposure.

Material should be handled or transferred in an approved fume hood or with adequate ventilation.

Protective gloves must be worn to prevent skin contact. (P280)

(Butyl, viton or equivalent)

Use eye protection tested and approved under the appropriate government standards such as NIOSH (US) or EN 166 (EU).

All recommendations are advisory only and must be evaluated by an industrial hygienist and/or safety officer familiar with the specific situation of anticipated use, such as concentration and amount of the substance in the workplace. Any recommendation should not be construed as offering an approval for any specific use of the product.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance: White crystalline solid

Odor: N/A

Odor Threshold: N/A

pH: N/A

Melting Point: 157.0-161.0°C

Boiling Point: N/A

Flash Point: N/A

Evaporation Rate (Butyl Acetate=1): N/A

Flammability Class: N/A

Lower Flammability Level: N/A

Upper Flammability Level: N/A

Vapor Pressure: N/A

Vapor Density (Air = 1): N/A

Specific Gravity: 1.10 g/cm3

Solubility in Water: Slight

Partition Coefficient: Log Kow: 5.4

Autoignition Temperature: N/A

Decomposition Temperature: N/A

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES *- continued*

Viscosity: N/A

VOC Content: N/A

Percent Volatile: N/A

SECTION 10 - STABILITY AND REACTIVITY

Stability: Stable

Materials to Avoid: Acids
Bases
Oxidizers

Hazardous Decomposition: Oxides of carbon; Hydrogen chloride gas

Hazardous Polymerization: Will not occur

Condition to Avoid: Excessive heat; Release to the environment

SECTION 11 - TOXICOLOGICAL INFORMATION

Human Health Toxicity

See section 2 for specific toxicological information for the ingredients of this product.

LD50 (Oral): Rat - 15 mg/kg

LD50 (Dermal) : N/A

LC50 (Inhalation): N/A

WARNING: This product contains chemical(s) known to the state of California to cause cancer.

No other information related to the toxicological properties of this product is available at this time.

SECTION 12 - ECOLOGICAL INFORMATION

Environmental Toxicity

By complying with sections 6 and 7 there should be no release to the environment.

LC50 (Fish): 0.02 mg/L 96H

EC50 (Aquatic Invertebrate): 0.24 mg/L 48H

BCF: 950 - Threshold for concern
High potential to bioaccumulate

No other information related to the ecological properties of this product is available at this time.

SECTION 13 - DISPOSAL CONSIDERATIONS

Recycle or incinerate at any EPA approved facility or dispose in compliance with Federal, State and local regulations. Empty containers must be triple-rinsed prior to disposal.

SECTION 14 - TRANSPORT INFORMATION

Transportation Information (DOT/IATA)

UN Number: UN2811

UN Shipping Class: 6.1

UN Packing Group: II

UN Proper Shipping Name: Toxic solid, organic, n.o.s. (Heptachlor epoxide)

SECTION 14 - TRANSPORT INFORMATION - *continued*

Poison by Inhalation: No

Marine Pollutant: No

SECTION 15 - REGULATORY INFORMATION

WARNING: This product contains chemical(s) known to the state of California to cause cancer.

The CAS number of this product is NOT listed on the TSCA Inventory.

This product is NOT subject to SARA section 313 reporting requirements.

For laboratory, research and development use only. Not for manufacturing or commercial purposes.

In addition to federal and state regulations, local regulations may apply. Check with your local regulatory authorities.

SECTION 16 - OTHER INFORMATION

This document has been designed to meet the requirements of OSHA, ANSI, GHS and CHIPs regulations.

The statements contained herein are offered for informational purposes only and are based on technical data that we believe to be accurate. The manufacturer will not assume any liability for the accuracy and completeness of this information. Final determination of the suitability of the material is the responsibility of the user. Although certain hazards are described herein, the user should not presume that these are the only hazards that exist. Since conditions and manner of use are outside of the manufacturers control, we make

NO WARRANTY OF MERCHANTABILITY, EXPRESSED OR IMPLIED, AND ASSUME NO LIABILITY RESULTING FROM ITS USE.

Legend : N/A = Not Available ND = Not Determined NR = Not Regulated

HMIS/NFPA HAZARD INDEX

0 - Minimal
1 - Slight
2 - Moderate
3 - Serious
4 - Severe

* - Additional Hazard

GHS HAZARD INDEX

Category 1 - Most Severe
Category 5 - Least Severe

**** End of Document ****

HEPTACHLOR **ICSC: 0743 (July 2003)**

1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene
1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methano-1H-indene
3,4,5,6,8,8a-Heptachlorodicyclopentadiene

CAS #: 76-44-8
UN #: 2761
EC Number: 200-962-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Not combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings, use appropriate extinguishing media.

PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	Convulsions. Tremor.	Use local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! See Inhalation.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .
Eyes		Wear safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	See Inhalation.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Rest. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. If appropriate, moisten first to prevent dusting. Sweep spilled substance into covered sealable containers. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from strong oxidants, metals and food and feedstuffs. Well closed. Keep in a well-ventilated room. Dry. Store in an area without drain or sewer access.

PACKAGING

Do not transport with food and feedstuffs.
Severe marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1; UN Pack Group: II

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

HEPTACHLOR **ICSC: 0743**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
WHITE CRYSTALS OR TAN WAXY SOLID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes above 160°C . This produces toxic fumes including hydrogen chloride. Reacts with strong oxidants. Attacks metals.

Formula: $C_{10}H_5Cl_7$
Molecular mass: 373.3
Decomposes at 160°C
Melting point: 95-96°C
Density: 1.6 g/cm³
Solubility in water: none
Vapour pressure, Pa at 25°C: 0.053
Octanol/water partition coefficient as log Pow: 5.27/5.44

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of dust, through the skin and by ingestion.

Effects of short-term exposure
The substance may cause effects on the central nervous system.

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed, especially if powdered.

Effects of long-term or repeated exposure
The substance may have effects on the liver. This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.05 mg/m^3, as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: (inhalable fraction): 0.05 mg/m^3; peak limitation category: II(8); carcinogen category: 4; pregnancy risk group: D

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur along the food chain, for example in fish and milk. The substance may cause long-term effects in the aquatic environment. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

Carrier solvents used in commercial formulations may change physical and toxicological properties.
Do NOT take working clothes home.
Depending on the degree of exposure, periodic medical examination is suggested.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 24/25-33-40-50/53; S: (1/2)-36/37-45-60-61

METHOXYCHLOR **ICSC: 1306 (March 1999)**

1,1-(2,2,2-Trichloroethylidene)bis(4-methoxybenzene)
1,1,1-Trichloro-2,2-bis(p-methoxyphenyl)ethane
Dimethoxy-DDT

CAS #: 72-43-5

EC Number: 200-779-9

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Use water spray, powder, alcohol-resistant foam, carbon dioxide.

PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation	See Ingestion.	Use local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Wear safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Convulsions. Diarrhoea. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Give one or two glasses of water to drink. Refer for medical attention .

SPILLAGE DISPOSAL

Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations. Do NOT let this chemical enter the environment.

STORAGE

Separated from food and feedstuffs. Well closed. Keep in a well-ventilated room.

PACKAGING

Do not transport with food and feedstuffs.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

METHOXYCHLOR **ICSC: 1306**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
COLOURLESS-TO-LIGHT-YELLOW CRYSTALS WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes on heating and on burning. This produces toxic and corrosive gases including hydrogen chloride (see ICSC 0163). Reacts with oxidants. Attacks some plastics and rubber.

Formula: $C_{16}H_{15}Cl_3O_2$
Molecular mass: 345.7
Melting point: 89°C
Density: 1.4 g/cm³
Solubility in water: none
Vapour pressure: negligible
Octanol/water partition coefficient as log Pow: 4.68/5.08

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

Effects of short-term exposure

Inhalation risk
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying or when dispersed, especially if powdered.

Effects of long-term or repeated exposure
Animal tests show that this substance possibly causes toxic effects upon human reproduction.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 10 mg/m^3, as TWA; A4 (not classifiable as a human carcinogen).
MAK: (inhalable fraction): 1 mg/m^3; peak limitation category: II(8); skin absorption (H); pregnancy risk group: B

ENVIRONMENT

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

NOTES

Ingestion in large amounts may cause effects on the liver, kidneys and central nervous system.
Temperature of decomposition is unknown in the literature.
Depending on the degree of exposure, periodic medical examination is suggested.
If the substance is formulated with solvent(s) also consult the card(s) (ICSC) of the solvent(s).
Carrier solvents used in commercial formulations may change physical and toxicological properties.
See ICSC 0034.

ADDITIONAL INFORMATION

EC Classification

CAMPHECHLOR **ICSC: 0843 (November 1997)**

Toxaphene
Chlorinated camphene (60%)
Polychlorocamphene

CAS #: 8001-35-2
UN #: 2761
EC Number: 232-283-3

	ACUTE HAZARDS	PREVENTION	FIRE FIGHTING
FIRE & EXPLOSION	Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire. See Notes.		Use foam, powder, carbon dioxide. NO water. In case of fire: keep drums, etc., cool by spraying with water. NO direct contact with water.

STRICT HYGIENE! IN ALL CASES CONSULT A DOCTOR!

	SYMPTOMS	PREVENTION	FIRST AID
Inhalation		Use local exhaust or breathing protection.	Fresh air, rest.
Skin	MAY BE ABSORBED! Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Wear safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Ingestion	Convulsions. Dizziness. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Give a slurry of activated charcoal in water to drink. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Rest. Refer for medical attention .

SPILLAGE DISPOSAL

Do NOT wash away into sewer. Sweep spilled substance into covered sealable containers. Carefully collect remainder. Then store and dispose of according to local regulations.

STORAGE

Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs. Keep in the dark.

PACKAGING

Do not transport with food and feedstuffs.
Marine pollutant.

CLASSIFICATION & LABELLING

According to UN GHS Criteria

Transportation
UN Classification
UN Hazard Class: 6.1

Prepared by an international group of experts on behalf of ILO and WHO, with the financial assistance of the European Commission.

CAMPHECHLOR **ICSC: 0843**

PHYSICAL & CHEMICAL INFORMATION

Physical State; Appearance
YELLOW-TO-AMBER WAXY SOLID WITH CHARACTERISTIC ODOUR.

Physical dangers

Chemical dangers
Decomposes on heating and on burning. Decomposes under the influence of alkali, strong sunlight and catalysts like iron. This produces toxic fumes. Attacks iron.

Formula: $C_{10}H_{10}Cl_8$ (approx.)
Molecular mass: 413.8 (average)
Melting point: 65-90°C
Relative density (water = 1): 1.65
Solubility in water: none
Vapour pressure, Pa at 25°C: 53
Relative vapour density (air = 1): 14.3
Octanol/water partition coefficient as log Pow: 3.3

EXPOSURE & HEALTH EFFECTS

Routes of exposure
The substance can be absorbed into the body through the skin and by ingestion.

Effects of short-term exposure
The substance is mildly irritating to the skin. The substance may cause effects on the central nervous system. This may result in tremors and convulsions. Exposure at high levels could cause death.

Inhalation risk

Effects of long-term or repeated exposure
This substance is possibly carcinogenic to humans.

OCCUPATIONAL EXPOSURE LIMITS

TLV: 0.5 mg/m^3, as TWA; 1 mg/m^3 as STEL; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans).
MAK: skin absorption (H); carcinogen category: 2

ENVIRONMENT

This substance may be hazardous to the environment. Special attention should be given to aquatic organisms, terrestrial organisms and birds. Bioaccumulation of this chemical may occur in aquatic organisms.

NOTES

Decomposes before boiling.
Camphechlor is a reaction mixture of chlorinated camphenes containing 67-69% chlorine.
Use of this organochlorine pesticide should be discouraged, except where there is no adequate alternative.
Depending on the degree of exposure, periodic medical examination is suggested.
Carrier solvents used in commercial formulations may change physical and toxicological properties.
Do NOT take working clothes home.

ADDITIONAL INFORMATION

EC Classification
Symbol: T, N; R: 21-25-37/38-40-50/53; S: (1/2)-36/37-45-60-61

APPENDIX E

HOSPITAL INFORMATION, MAP AND FIELD ACCIDENT REPORT

FIELD ACCIDENT REPORT

This report is to be filled out by the designated Site Safety Officer after EVERY accident.

PROJECT NAME_____ PROJECT. NO._____

Date of Accident_____ Time _____ Report By_____

Type of Accident (Check One):

( ) Vehicular ( ) Personal ( ) Property

Name of Injured_____ DOB or Age_____

How Long Employed_____

Names of Witnesses _____
_____
_____

Description of Accident_____
_____
_____
_____

Action Taken_____
_____
_____
_____

Did the Injured Lose Any Time? _____ How Much (Days/Hrs.)?_____

Was Safety Equipment in Use at the Time of the Accident (Hard Hat, Safety Glasses, Gloves, Safety Shoes, etc.)?_____
_____

(If not, it is the EMPLOYEE'S sole responsibility to process his/her claim through his/her Health and Welfare Fund.)

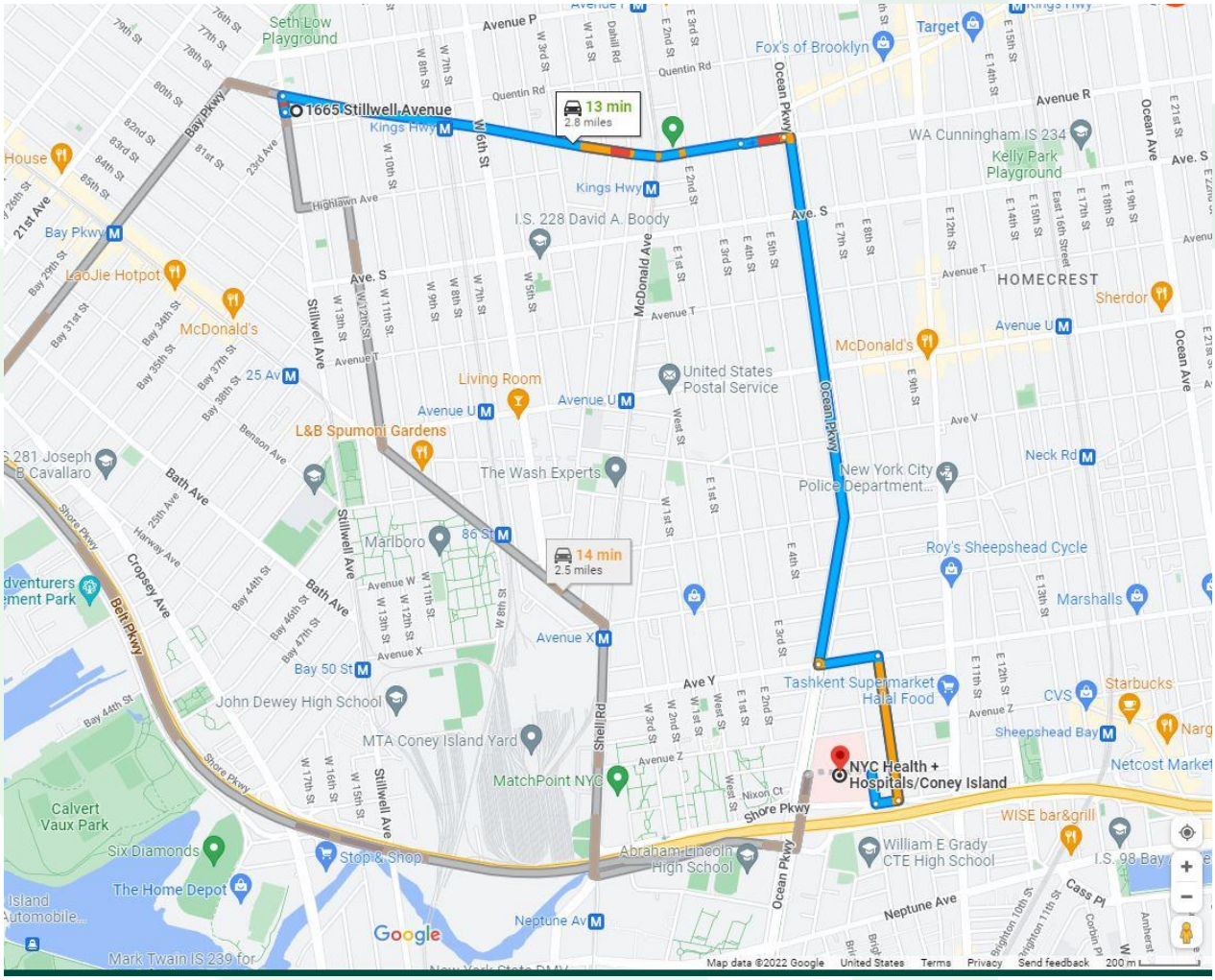
INDICATE STREET NAMES, DESCRIPTION OF VEHICLES, AND NORTH ARROW

HOSPITAL INFORMATION AND MAP

The hospital nearest the site is:

Coney Island Hospital Emergency Department
2601 Ocean Parkway, Brooklyn, NY 11235
718-616-4327

Figure 1 – Directions



START

1. Head west toward Stillwell Ave
2. Take Kings Hwy and Ocean Pkwy to Hubbard St
3. Take right onto Hubbard St
4. Hubbard St turns right and becomes Ocean Shore Pkwy
5. Turn right onto E 6th St
6. NYC Health + Hospitals/Coney Island is on the left
   2601 Ocean Parkway, Brooklyn, NY 11235

END

Appendix B

COMMUNITY AIR MONITORING PLAN (CAMP)

Real-time air monitoring for volatile organic compounds (VOCs) and particulate levels at the perimeter of the exclusion zone or work area will be performed. Continuous monitoring will be performed for all ground intrusive activities and during the handling of contaminated or potentially contaminated media. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pit excavation or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be performed during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. Periodic monitoring during sample collection, for instance, will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence. Exceedances of action levels observed during performance of the Community Air Monitoring Plan (CAMP) will be reported to the OER Project Manager and included in the Daily Report.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.

All 15-minute readings must be recorded and be available for OER personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m3 above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m3 above the upwind level, work will be stopped, and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m3 of the upwind level and in preventing visible dust migration.

All readings will be recorded and be available for OER personnel to review.

Appendix C

CITIZEN PARTICIPATION PLAN (CPP)

NEW YORK STATE | Department of Environmental Conservation

Brownfield Cleanup Program

Citizen Participation Plan
for
Stillwell Avenue Project

November 2021

C224307
1665 Stillwell Avenue
Brooklyn, NY 11223

Prepared By:
American Environmental Solutions, Inc.
42 West Avenue
Patchogue, NY 11772
(631) 475-0020/(631) 475-0025 fax

www.dec.ny.gov

Contents

* * * * *

Note: The information presented in this Citizen Participation Plan was current as of the date of its approval by the New York State Department of Environmental Conservation (NYSDEC). Portions of this Citizen Participation Plan may be revised during the Site's investigation and cleanup process.

Applicant: **Refulgence LLC (" Applicant")**
Site Name: **1665 Stillwell Avenue ("Site")**
Site Address: **1665 - 1673 Stillwell Avenue**
Site County: **Kings County**
Site Number: **C224307**

1. What is New York's Brownfield Cleanup Program?

New York' s Brownfield Cleanup Program (BCP) works with private developers to encourage the voluntary cleanup of contaminated properties known as "brownfields" so that they can be reused and developed. These uses include recreation, housing, and business.

A *brownfield* is any real property that is difficult to reuse or redevelop because of the presence or potential presence of contamination. A brownfield typically is a former industrial or commercial property where operations may have resulted in environmental contamination. A brownfield can pose environmental, legal, and financial burdens on a community. If a brownfield is not addressed, it can reduce property values in the area and affect economic development of nearby properties.

The BCP is administered by the New York State Department of Environmental Conservation (NYSDEC) which oversees Applicants who conduct brownfield site investigation and cleanup activities. An Applicant is a person who has requested to participate in the BCP and has been accepted by NYSDEC. The BCP contains investigation and cleanup requirements, ensuring that cleanups protect public health and the environment. When NYSDEC certifies that these requirements have been met, the property can be reused or redeveloped for the intended use.

For more information about the BCP, go online at: http://www.dec.ny.gov/chemical/8450.html .

2. Citizen Participation Activities

Why NYSDEC Involves the Public and Why It Is Important

NYSDEC involves the public to improve the process of investigating and cleaning up contaminated sites, and to enable citizens to participate more fully in decisions that affect their health, environment, and social well-being. NYSDEC provides opportunities for citizen involvement and encourages early two-way communication with citizens before decision-makers form or adopt final positions.

Involving citizens affected and interested in site investigation and cleanup programs is important for many reasons. These include:

- Promoting the development of timely, effective site investigation and cleanup programs that protect public health and the environment;

- Improving public access to, and understanding of, issues and information related to a particular site and that site's investigation and cleanup process;
- Providing citizens with early and continuing opportunities to participate in NYSDEC's site investigation and cleanup process;
- Ensuring that NYSDEC makes site investigation and cleanup decisions that benefit from input that reflects the interests and perspectives found within the affected community; and
- Encouraging dialogue to promote the exchange of information among the affected/interested public, State agencies, and other interested parties that strengthens trust among the parties, increases understanding of site and community issues and concerns, and improves decision-making.

This Citizen Participation (CP) Plan provides information about how NYSDEC will inform and involve the public during the investigation and cleanup of the site identified above. The public information and involvement program will be carried out with assistance, as appropriate, from the Applicant.

Project Contacts

Appendix A identifies NYSDEC project contact(s) to whom the public should address questions or request information about the site's investigation and cleanup program. The public's suggestions about this CP Plan and the CP program for the site are always welcome. Interested people are encouraged to share their ideas and suggestions with the project contacts at any time.

Locations of Reports and Information

The locations of the reports and information related to the site's investigation and cleanup program also are identified in Appendix A. These locations provide convenient access to important project documents for public review and comment. Some documents may be placed on the NYSDEC website. If this occurs, NYSDEC will inform the public in fact sheets distributed about the site and by other means, as appropriate.

Site Contact List

Appendix B contains the site contact list. This list has been developed to keep the community informed about, and involved in, the site's investigation and cleanup process. The site contact list will be used periodically to distribute fact sheets that provide updates about the status of the project. These will include notifications of upcoming activities at the site (such as fieldwork), as well as availability of project documents and announcements about public comment periods.

The site contact list includes, at a minimum:

- Chief executive officer and planning board chairperson of each county, city, town, and village in which the site is located;
- Any residents, owners, and occupants of the site and properties adjacent to the site;
- The public water supplier which services the area in which the site is located;
- Any person who has requested to be placed on the site contact list;
- The administrator of any school or day care facility located on or near the site for purposes of posting and/or dissemination of information at the facility; and
- Location(s) of reports and information.

The site contact list will be reviewed periodically and updated as appropriate. Individuals and organizations will be added to the site contact list upon request. Such requests should be submitted to the NYSDEC project contact(s) identified in Appendix A. Other additions to the site contact list may be made at the discretion of the NYSDEC project manager, in consultation with other NYSDEC staff as appropriate.

Note: The first site fact sheet (usually related to the draft Remedial Investigation Work Plan) is distributed both by paper mailing through the postal service and through DEC Delivers, its email listserv service. The fact sheet includes instructions for signing up with the appropriate county listserv to receive future notifications about the site.
See http:// www.dec.ny.gov/chemica l/61092.html .

Subsequent fact sheets about the site will be distributed exclusively through the listserv, except for households without internet access that have indicated the need to continue to receive site information in paper form. Please advise the NYSDEC site project manager identified in Appendix A if that is the case. Paper mailings may continue during the investigation and cleanup process for some sites, based on public interest and need.

CP Activities

The table at the end of this section identifies the CP activities, at a minimum, that have been and will be conducted during the site' s investigation and cleanup program. The flowchart in Appendix D shows how these CP activities integrate with the site investigation and cleanup process. The public is informed about these CP activities through fact sheets and notices distributed at significant points during the program. Elements of the investigation and cleanup process that match up with the CP activities are explained briefly in Section 5.

- **Notices and fact sheets** help the interested and affected public to understand contamination issues related to a site, and the nature and progress of efforts to investigate and clean up a site.

- **Public forums, comment periods and contact with project managers** provide opportunities for the public to contribute information, opinions and perspectives that have potential to influence decisions about a site's investigation and cleanup.

The public is encouraged to contact project staff at any time during the site's investigation and cleanup process with questions, comments, or requests for information.

This CP Plan may be revised due to changes in major issues of public concern identified in Section 3 or in the nature and scope of investigation and cleanup activities. Modifications may include additions to the site contact list and changes in planned citizen participation activities.

Technical Assistance Grant

NYSDEC must determine if the site poses a significant threat to public health or the environment. This determination generally is made using information developed during the investigation of the site, as described in Section 5.

If the site is determined to be a significant threat, a qualifying community group may apply for a Technical Assistance Grant (TAG). The purpose of a TAG is to provide funds to the qualifying group to obtain independent technical assistance. This assistance helps the TAG recipient to interpret and understand existing environmental information about the nature and extent of contamination related to the site and the development/implementation of a remedy.

An eligible community group must certify that its membership represents the interests of the community affected by the site, and that its members' health, economic well-being, or enjoyment of the environment may be affected by a release or threatened release of contamination at the site.

As of the date the declaration (page 2) was signed by the NYSDEC project manager, it has been determined that the site does not pose a significant threat.

To verify the significant threat status of the site, the interested public may contact the NYSDEC project manager identified in Appendix A.

For more information about TAGs, go online at http://www.dec.ny.gov/regulations/2590.html

Note: The table identifying the citizen participation activities related to the site's investigation and cleanup program follows on the next page:

Citizen Participation Activities	Timing of CP Activity(ies)
Application Process:	
• Prepare site contact list • Establish document repository(ies)	At time of preparation of application to participate in the BCP.
• Publish notice in Environmental Notice Bulletin (ENB) announcing receipt of application and 30-day public comment period • Publish above ENB content in local newspaper • Mail above ENB content to site contact list • Conduct 30-day public comment period	When NYSDEC determines that BCP application is complete. The 30-day public comment period begins on date of publication of notice in ENB. End date of public comment period is as stated in ENB notice. Therefore, ENB notice, newspaper notice, and notice to the site contact list should be provided to the public at the same time.
After Execution of Brownfield Site Cleanup Agreement (BCA):	
• Prepare Citizen Participation (CP) Plan	Before start of Remedial Investigation **Note:** Applicant must submit CP Plan to NYSDEC for review and approval within 20 days of the effective date of the BCA.
Before NYSDEC Approves Remedial Investigation (RI) Work Plan:	
• Distribute fact sheet to site contact list about proposed RI activities and announcing 30-day public comment period about draft RI Work Plan • Conduct 30-day public comment period	Before NYSDEC approves RI Work Plan. If RI Work Plan is submitted with application, public comment periods will be combined and public notice will include fact sheet. Thirty-day public comment period begins/ends as per dates identified in fact sheet.
After Applicant Completes Remedial Investigation:	
• Distribute fact sheet to site contact list that describes RI results	Before NYSDEC approves RI Report
Before NYSDEC Approves Remedial Work Plan (RWP):	
• Distribute fact sheet to site contact list about draft RWP and announcing 45-day public comment period • Public meeting by NYSDEC about proposed RWP (if requested by affected community or at discretion of NYSDEC project manager) • Conduct 45-day public comment period	Before NYSDEC approves RWP. Forty-five day public comment period begins/ends as per dates identified in fact sheet. Public meeting would be held within the 45-day public comment period.
Before Applicant Starts Cleanup Action:	
• Distribute fact sheet to site contact list that describes upcoming cleanup action	Before the start of cleanup action.
After Applicant Completes Cleanup Action:	
• Distribute fact sheet to site contact list that announces that cleanup action has been completed and that NYSDEC is reviewing the Final Engineering Report • Distribute fact sheet to site contact list announcing NYSDEC approval of Final Engineering Report and issuance of Certificate of Completion (COC)	At the time the cleanup action has been completed. **Note:** The two fact sheets are combined when possible if there is not a delay in issuing the COC.

3. Major Issues of Public Concern

This section of the CP Plan identifies major issues of public concern that relate to the site. Additional major issues of public concern may be identified during the course of the site's investigation and cleanup process.

The site is located adjacent to an Environmental Justice Area. Environmental justice is defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Environmental justice efforts focus on improving the environment in communities, specifically minority and low-income communities, and addressing disproportionate adverse environmental impacts that may exist in those communities.

The site is located in an area with a sizable Asian-American Community nearby. Therefore, all future fact sheets will be translated into Chinese.

For additional information, visit:
https://popfactfinder.planning.nyc.gov/profile/2557/demographic

In addition, other concerns include noise, odor, and truck-related traffic issues.

Contaminants of concern identified at the Site include the chlorinated Volatile Organic Compounds (VOCs) Tetrachloroethene (PCE) (ranging from 231µg/m3 to 3,730 µg/m3) and Trichloroethene (TCE) (ranging from l.93 µg/m3 to 73.6 µg/m3), identified in the soil vapor samples collected throughout the Site. PCE and TCE were not identified in the soil samples obtained from the Site. Metals were identified in the shallow soil and is expected to be managed via excavation to redevelop the Site. VOCs and SVOCs were identified in the groundwater up-gradient at the Site. The area of concern was identified in the northeastern portion of the Site.

During excavation or ground intrusive activities the community will be protected from contamination migration as per the Community Air Monitoring Plan (CAMP) prepared for the Site, using air monitoring protocols and management of derived waste as detailed in the Remedial Investigation Work Plan (RIWP) and available in the document repositories.

The redevelopment of the Site will consist of the construction of a five story mixed use building with a cellar. The building foundation will be at the depth of 10 feet, 4 inches. The footprint of the building upon completion will be approximately 4,030 square feet. The cellar will contain the electric room, refuse room, bicycle parking, elevator, gas, and sprinkler room, common areas.

The building will contain sixteen units of residential housing on floors two through five and retail/commercial usage on the first floor. Upon completion, the building will be approximately 15,904.30 square feet. The eastern portion of the Subject Property will be a rear yard containing eight parking spaces. A driveway will be constructed on the southern part of the Site, providing access to the rear yard.

The proposed end-use of the site will be mixed use with commercial space on the first floor and residential apartments on floors 2,3, 4 and 5.

4. Site Information
Site Description

The Site is located at 1665 Stillwell Avenue in the Gravesend section of Brooklyn, NY. The Subject Property consists of a rectangular-shaped lot containing a one story commercial building, identified as Block 6618; Lot 48 on the NYC Tax map. The Site is located on the eastern side of Stillwell Avenue between Kings Highway to the north and Quentin Road to the south. The Subject Property is enclosed by a one story building (Brooklyn Public Library) and a two story mixed-use building to the east, by a one story commercial building (garage) to the north, by a 2.5 story residential building to the south, and Stillwell Avenue to the west. The elevation of the Subject Property is approximately 20 feet above sea level (USGS 7 1/2-Minute Coney Island, Brooklyn,

The total area of the Subject Property is approximately 8,000 square feet. The footprint of the existing building is approximately 2,400 square feet in area. The property is zoned as R6B; Residential District, with the Commercial overlay zoning C2-3 that allows for commercial usage. The occupancy code with the New York City Department of Finance for the Subject Property is listed as Kl; Store Building. The Little "E" Restriction for the Subject Property is listed as "***Hazmat"***

Appendix C contains a map identifying the location of the site.

History of Site Use, Investigation, and Cleanup

The Site currently contains a vacant one story building. Historical information indicated that past usage of the Site included dairy, thrift shop and dry-cleaners. Information obtained from Fire Insurance maps, indicated that the Site was developed prior to 1969 with a one story building, and a parking area in the western portion of the lot.

Information obtained from City Directory for the Site listed previous occupant as:

- Grandview Dairy from around year 1970 and 1973;
- Stillwell Dairy in year 1976;
- Wonder Hostess Thrift Shop around year 1985 and 1997; and
- Then converted to a dry-cleaner in 1999 (NYCDOB job number 300846155) and occupied by Ideal Cleaners from around 2000 through 2014.

Information obtained from the New York City Department of Buildings (NYCDOB) records for the Subject Property indicated usage of the Site was "ice cream dispensing stand" at 1671-1673 Stillwell Avenue in 1955 (Certificate of Occupancy# 142477, dated 01/19/1955), and "food store, with one loading/unloading berth and twelve accessory auto parking in open space" at 1665-1673 Stillwell Avenue, lots 48 and 50 (Certificate of Occupancy# 195912, dated 11/09/1966).

The Subject Property was investigated in accordance with the scope of work presented in Phase II Work Plan dated May 24th, 2019. Field activities consisted of a Ground Penetrating Radar (GPR) survey and the installation and sampling of seven (7) soil borings, t h r e e (3) temporary monitoring wells and six (6) soil vapor probes. The investigation contaminants in soil vapor throughout the Site, hotspot areas contaminated with low-concentration of metals in the shallow soil, and VOCs and SVOCs in the groundwater up-gradient at the Site.

5. Investigation and Cleanup Process

Application

The Applicant has applied for and been accepted into New York's Brownfield Cleanup Program as a Participant. This means that the Applicant was the owner of the site at the time of the disposal or discharge of contaminants or was otherwise liable for the disposal or discharge of the contaminants. The Participant must fully characterize the nature and extent of contamination onsite, as well as the nature and extent of contamination that has migrated from the site. The Participant also must conduct a "qualitative exposure assessment" a process that characterizes the actual or potential exposures of people, fish, and wildlife the actual or potential exposures of people, fish, and wildlife to contaminants on the site and to contamination that has migrated from the site.

The Applicant in its Application proposes that the site will be used for restricted purposes.

To achieve this goal, the Applicant will conduct investigation activities at the site with oversight provided by NYSDEC. The Brownfield Cleanup Agreement executed by NYSDEC and the Applicant sets forth responsibilities of each party in conducting these activities at the site.

Investigation

The Applicant has completed a partial site investigation before it entered into the BCP. For the partial investigation, NYSDEC will determine if the data are useable.

The Applicant will conduct an investigation of the site officially called a "remedial investigation" (RI). This investigation will be performed with NYSDEC oversight. The Applicant must develop a Remedial Investigation Work Plan, which is subject to public comment.

The site investigation has several goals:

1) Define the nature and extent of contamination in soil, surface water, groundwater and any other parts of the environment that may be affected;
2) Identify the source(s) of the contamination;
3) Assess the impact of the contamination on public health and the environment; and
4) Provide information to support the development of a proposed remedy to address the contamination or the determination that cleanup is not necessary.

The Applicant submits a Remedial Investigation Work Plan (RIWP) to NYSDEC for review and approval. NYSDEC makes the RIR available to the public review during a 30-day public comment period.

When the investigation is complete, the Applicant will prepare and submit a report that summarizes the results. This report also will recommend whether cleanup action is needed to address site-related contamination. The investigation report is subject to review and approval by NYSDEC.

NYSDEC will use the information in the investigation report to determine if the site poses a significant threat to public health or the environment. If the site is a "significant threat," it must be cleaned up using a remedy selected by NYSDEC from an analysis of alternatives prepared by the Applicant and approved by NYSDEC. If the site does not pose a significant threat, the Applicant may select the remedy from the approved analysis of alternatives.

Interim Remedial Measures

An Interim Remedial Measure (IRM) is an action that can be undertaken at a site when a source of contamination or exposure pathway can be effectively addressed before the site investigation and analysis of alternatives are completed. If an IRM is likely to represent all or a significant part of the final remedy, NYSDEC will require a 30-day public comment period.

Remedy Selection

When the investigation of the site has been determined to be complete, the project likely would proceed in one of two directions:

1. The Applicant may recommend in its investigation report that no action is necessary at the site. In this case, NYSDEC would make the investigation report available for public comment for 45 days. NYSDEC then would complete its review, make any necessary revisions, and, if appropriate, approve the investigation report. NYSDEC would then issue a "Certificate of Completion" (described below) to the Applicant.

or

2. The Applicant may recommend in its investigation report that action needs to be taken to address site contamination. After NYSDEC approves the investigation report, the Applicant may then develop a cleanup plan, officially called a "Remedial Work Plan". The Remedial Work Plan describes the Applicant's proposed remedy for addressing contamination related to the site.

When the Applicant submits a draft Remedial Work Plan for approval, NYSDEC would announce the availability of the draft plan for public review during a 45-day public comment period.

Cleanup Action

NYSDEC will consider public comments, and revise the draft cleanup plan if necessary, before approving the proposed remedy. The New York State Department of Health (NYSDOH) must concur with the proposed remedy. After approval, the proposed remedy becomes the selected remedy. The selected remedy is formalized in the site Decision Document.

The Applicant may then design and perform the cleanup action to address the site contamination. NYSDEC and NYSDOH oversee the activities. When the Applicant completes cleanup activities, it will prepare a Final Engineering Report (FER) that certifies that cleanup requirements have been achieved or will be achieved within a specific time frame. NYSDEC will review the report to be certain that the cleanup is protective of public health and the environment for the intended use of the site.

Certificate of Completion

When NYSDEC is satisfied that cleanup requirements have been achieved or will be achieved for the site, it will approve the FER. NYSDEC then will issue a Certificate of Completion (COC) to the Applicant. The COC states that cleanup goals have been achieved and relieves the Applicant from future liability for site-related contamination, subject to certain conditions. The Applicant would be eligible to redevelop the site after it receives a COC.

Site Management

The purpose of site management is to ensure the safe reuse of the property if contamination will remain in place. Site management is the last phase of the site cleanup program. This phase begins when the COC is issued. Site management incorporates any institutional and engineering controls required to ensure that the remedy implemented for the site remains protective of public health and the environment. All significant activities are detailed in a Site Management Plan.

An *institutional control* is a non-physical restriction on use of the site, such as a deed restriction that would prevent or restrict certain uses of the property. An institutional control may be used when the cleanup action leaves some contamination that makes the site suitable for some, but not all uses.

An *engineering control* is a physical barrier or method to manage contamination. Examples include caps, covers, barriers, fences, and treatment of water supplies.

Site management also may include the operation and maintenance of a component of the remedy, such as a system that pumps and treats groundwater. Site management continues until NYSDEC determines that it is no longer needed.

Appendix A-
Project Contacts and Locations of Reports and Information

Project Contacts

For information about the site's investigation and cleanup program, the public may contact any of the following project staff:

New York State Department of Environmental Conservation (NYSDEC):

Meghan Medwid
Project Manager
NYSDEC
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7016
Telephone: 518-402-9767
Email: Meghan.medwid@dec.ny.gov

Jane H. O' Connell, P.G
NYSDEC Region 2
Division of Environmental Remediation
47-40 21st Street
Long Island City, NY 11101
Telephone: 718-482-4599
Email: jane.oconnell@dec.ny.gov

New York State Department of Health (NYSDOH):

Anthony Perretta
Public Health Specialist
NYSDOH
Bureau of Environmental Exposure
Corning Tower Room 1787
Albany, NY 12237
Telephone: (518) 402-1365
Email:Anthony.perretta@health.ny.gov

Locations of Reports and Information

The facilities identified below are being used to provide the public with convenient access to important project documents:

Brooklyn Public Library- Highlawn Branch
1664 West 13th Street, at Kings Highway
Brooklyn, NY 11223
Attn: Managing Librarian
Phone: 718-234-7208
Hours: closed for Covid-19

Brooklyn Community Board 11
2214 Bath Avenue
Brooklyn, NY 11214
Attn: Mamee Elias-Pavia, District Manager
Phone: 718-266-8800
Email: Kll @cb.nyc.gov
Hours: by appointment due to Covid-19

Appendix B - Site Contact List

Local Government Contacts

Hon. William de Blasio Mayor of New York City City Hall New York, NY 10007	Hon. Eric Adams Brooklyn Borough President 209 Joralemon Street Brooklyn, NY 11201
William Guarinello Chairman, Brooklyn Community Board 11 2214 Bath Avenue Brooklyn, New York 11214	Antonia Trioa – Environmental Committee Brooklyn Community Board 11 2214 Bath Avenue Brooklyn, New York 11214
Hon. Kalman Yeger NYC Council Member-44th District 4424 16th Avenue Brooklyn, NY 11204	Anita Laremont NYC Depart. of City Planning 120 Broadway, 31st Floor New York, NY 10271
Keith Bray NYC Department of Transportation Brooklyn Borough Commissioner 55 Water Street, 9th Floor New York, NY 10041	Nancy T. Sunshine, County Clerk Kings County Clerk's Office 360 Adams Street, Room 189 Brooklyn, NY 11201
Hon. JumaaneWilliams Public Advocate 1 Centre Street, 15th Floor New York, NY 10007	Hon. Scott M. Stringer Office of the Comptroller 1 Centre Street New York, NY 10007
Hon. William Colton - District 47 NYS Assembly Member 155 Kings Highway Brooklyn, NY 11223	Hon. Charles Schumer U.S. Senator 780 Third Avenue, Suite 2301 New York, NY 10017
Hon. Simcha Felder NYS Senator 1412 Avenue J, Suite 2E Brooklyn, NY 11230	Hon. Kristen Gillibrand U.S. Senator 780 Third Avenue, Suite 2601 New York, NY 10017
Congressman - District 10 Hon. Jerrold Nadler 6605 Fort Hamilton Parkway Brooklyn, NY 11219	Julie Stein Office of Environmental Planning & Assessment NYC Dept. of Environmental Protection 96-05 Horace Harding Expressway Flushing NY 11373
Vincent Sapienza Commissioner, NYC Dept. of Environmental Protection 59-17 Junction Boulevard Flushing, NY 11373	Mark McIntyre NYC Depart. of Environmental Remediation 100 Gold Street New York, NY 10038

Adjacent Property Owner Contacts:
Contact information for the identified owners, as listed in the New York City ACRIS Database, are as follows:

Direction	Adjacent Properties	Owner
North	1663 Stillwell Avenue/ 126-136 Kings Hwy 1 story commercial building (garage).	Goodview LLC Greenview Queens Realty LLC
South	1677 Stillwell Avenue 2.5 story residential building.	Peter Konstas Maria Konstas
East	1672-1674 West 13th Street 2 story mixed-use building.	Anchor Equity Holding LLC
	1664-1670 West 13th Street 1 story public building (Brooklyn Public library-Highlawn branch).	Brooklyn Public Library
West	2271 78th Street 2 story residential building.	Gao Ming Yang Yan Fen Yang Zheng Jian
	2273-2279 73th Street 2 story residential building.	Simon Attias Sheryl Attias

South at end of Block 6618
1683 Stillwell Avenue / 1 Quentin Road
Owners: Demetrios Konstas, Smaro Konstas, Despinad Konstas

Southeast end of block
13-27 Quentin Road/ 1676-1684 West 13th Street
Anchor Equity Holding LLC

Local News Media

Brooklyn Daily Eagle 16 Court Street, 30th Floor Brooklyn, New York 11241	World Journal (Chinese) 141-07 20th Avenue Whitestone, NY 11357
Sing Tao Daily 5510 8th Avenue, Room 202 Brooklyn, NY 11220	Courier-Life Publications 1 Metrotech Center #10T Brooklyn, NY 11201
New York Daily News 4 New York Plaza New York, NY 10004	New York 1 News 75 Ninth Avenue New York, NY 10011
The Brooklyn Papers 1 Metrotech Center, 3rd Floor Brooklyn, NY 11201	New York Post 1211 Avenue of the Americas New York, NY 10036

Public Water Supplier:
New York City Department of Environmental Protection
Bureau of Water Supply
59-17 Junction Boulevard, llth Floor
Flushing, New York 11373

Schools and Daycare Facilities:
The following Schools and Daycare facilities were identified within a one-half mile radius of the project site.

Gold Material Montessori School
105 Kings Hwy, Brooklyn, NY 11214
(718) 253-2552
Maksim Kondrukevich

Intermediate School 96
99 Avenue P, Brooklyn, NY 11204
718-236-1344
Erin Lynch, Principal
PS 97 -The Highlawn
1855 Stillwell Avenue, Brooklyn, NY 11223
718-627-7550
Irina Cabello, Principal

Hebrew Language Academy Charter School 2
1870 Stillwell Avenue, Brooklyn NY 11223
718-682-5610
Ashley Furan, Head of School

Brooklyn School of Inquiry
50 Avenue P, 4th Floor, Brooklyn, NY 11204
718-621-573
Debra Nier, Administrative Secretary

Success Academy
99 Avenue P, Floor 4, Brooklyn, NY 11204
347-514-7082
Kerri Lynch, Principal

PS 128 Bensonhurst
2075 4th Street, Brooklyn, NY 11214
718-373-5900
Jessica Drzewucki, Principal/Administrator

Sinai Academy Junior High and High School
2025 79th Street, Brooklyn, NY 11214
718-256-7400

Rabbi Aryeh Katzin,
Principal St. Peter Catholic
Academy
8401 23rd Avenue, Brooklyn, NY 11214
718-372-0025
Danielle Alfeo, Principal

Atidaynu - Our Future School, LLC
7914 Bay Parkway,
Brooklyn, NY 11214
718-233-9098
Simi Bazov, Principal

Stillwell Avenue Prep & Nursery
1990 Stillwell Avenue,
Brooklyn, NY 11223
718-265-2220
Candy Juba, Executive Director

Brooklyn Studio Secondary School
8310 21st Avenue,
Brooklyn, NY 11214
718-266-5032
Andrea Cilliotta, Principal

Magen David Yeshivah Celia Esses High
School 7801 Bay Parkway,
Brooklyn, NY 11214
718-331-4002
Rabbi Saul Zucker, Principal

Edith and Karl Marks JCH of Bensonhurst
7802 Bay Parkway
Brooklyn, NY 11214

Community, Civic, Religious and other Environmental Organizations

Local Community Board

Brooklyn Community Board 11
2214 Bath Avenue
Brooklyn, NY 11214
Attn: Marnee Elias-Pavia, District Manager
Phone: 718-266-8800
Email: Kll@cb.nyc.gov
Hours: by appointment due to Covid-19

Antonia Yuille - Director
Consolidated Edison Corporate Affairs
30 Flatbush Avenue
Brooklyn, NY 11217

Louis Tromboli - President
62nd Police Precinct Council
1925 Bath Avenue
Brooklyn, NY 11214

Engine 253
FDNY
2429 86th Street
Brooklyn, NY 11214

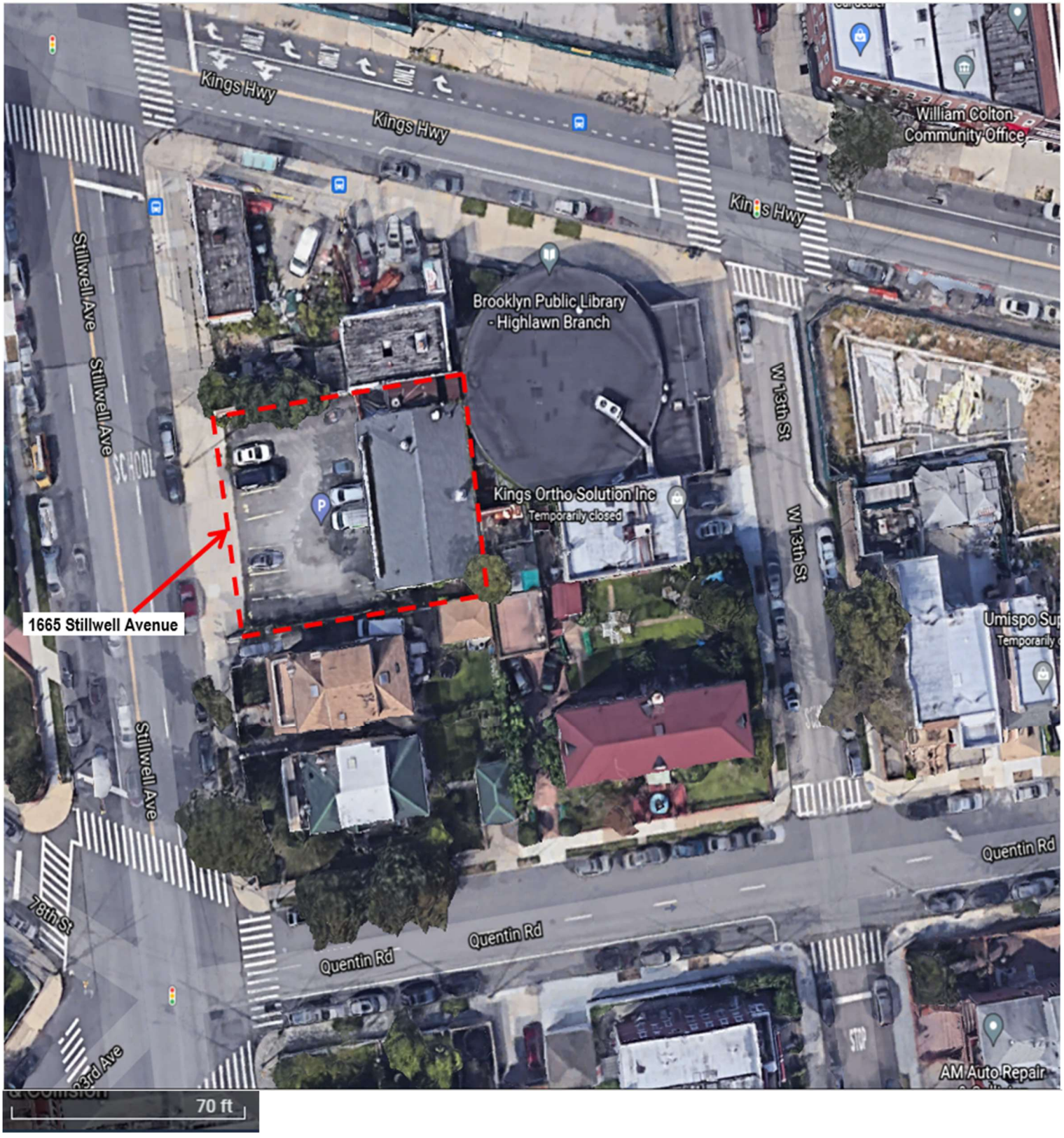
Asian Chinese United Society
1884 86th Street
Brooklyn, New York 11214

Brooklyn Chinese American Association
6701 20th Avenue
Brooklyn, NY 11204

Federation of Italian American Organizations
8711 18th Avenue
Brooklyn, NY 11204
National Federation – Italian American Societies
7704 17th Ave
Brooklyn, New York 11214

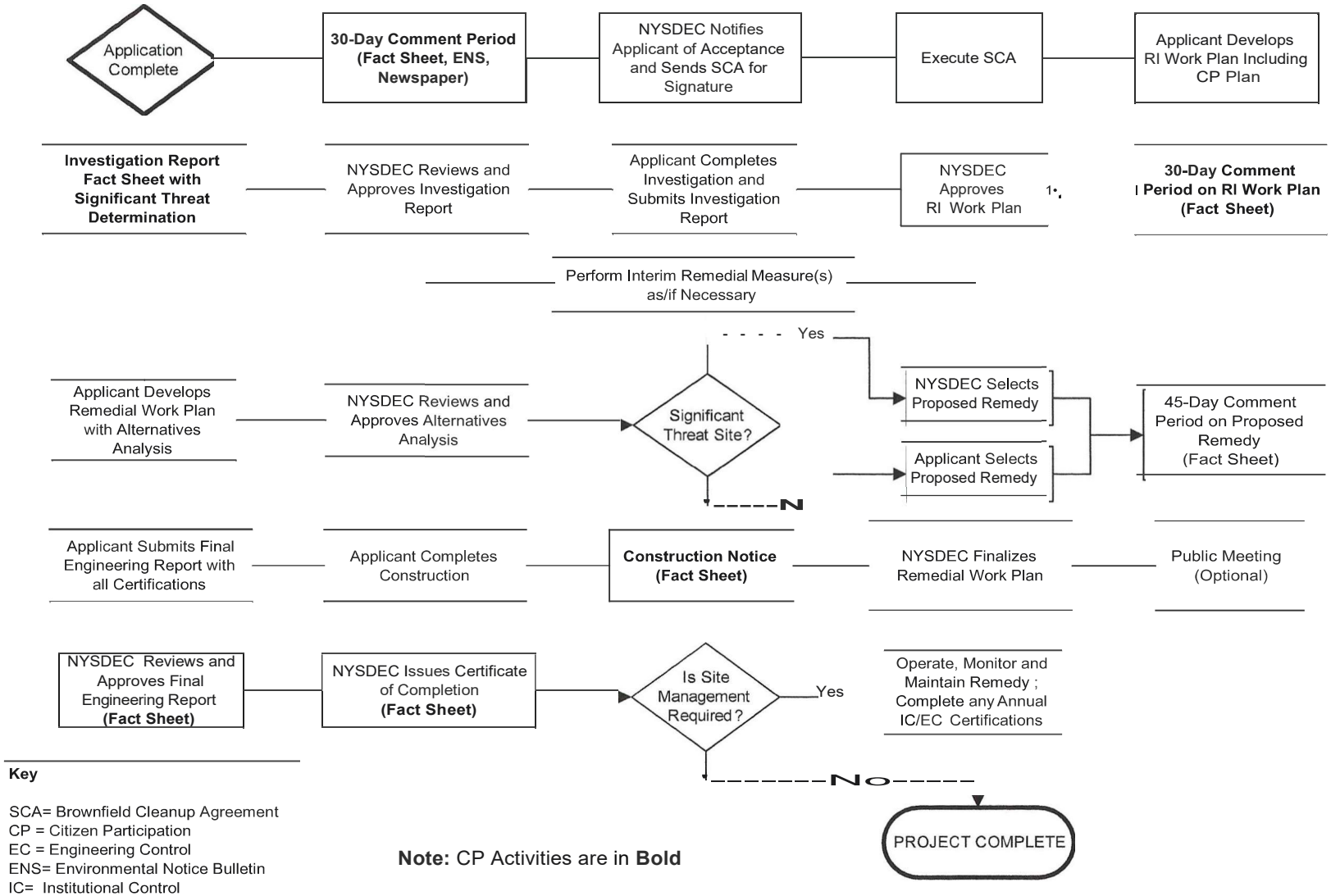
United Chinese Association
1787 Stillwell Ave
Brooklyn, NY 11223

Appendix C - Site Location Map



Site Boundary	Site Name: STILLWELL AVENUE Address: 1665 -1673 Stillwell Avenue Brooklyn, NY 11223
American Environmental Solutions Inc.	N

Appendix D- Brownfield Cleanup Program Process



Key

SCA= Brownfield Cleanup Agreement
CP = Citizen Participation
EC = Engineering Control
ENS= Environmental Notice Bulletin
IC= Institutional Control
RI = Remedial Investigation

Note: CP Activities are in **Bold**

NEW YORK STATE OF OPPORTUNITY. | Department of Environmental Conservation

Division of Environmental Remediation

Remedial Programs
Scoping Sheet for Major Issues of Public Concern

Site Name: 1665 Stillwell Avenue

Site Number: C224307

Site Address and County: 1665 -1673 Stillwell Avenue, Brooklyn (Kings County), NY

Remedial Party(ies): Refulgence LLC

Note: For Parts 1. - 3. the individuals, groups, organizations, businesses, and units of government identified should be added to the site contact list as appropriate.

Part I. List major issues of public concern and information the community wants. Identify individuals, groups, organizations, businesses and/or units of government related to the issue(s) and information needs. **Use this information as an aid to prepare or update the Major Issues of Public Concern section of the site Citizen Participation Plan.**

- The Site is proposed to be redeveloped with a new five story mixed-use building. The building will contain sixteen units of residential housing on floors two through five and commercial use on the first floor.
- The Site's contamination issues stem from the previous occupant use, and historical fill material and surrounding use.
- A Remedial Investigation (RI) was conducted to determine the nature and extent of on-site contamination, identify the source(s), assess the impact on public health and/or the environment, and support the Remedial Action Work Plan (RAWP) to remediate the Site. The RI was completed in accordance with the approved NYCOER Work Plan prepared to facilitate the redevelopment of the Site.
- Contact information is located in Appendix A.
- Adjacent property occupants and owners will be kept informed about the progress of the Site cleanup activities. Periodic fact sheets will be sent by mail.
- Local, state, and federal officials will be contacted about the Site remediation activities.
- The Site will be cleaned up to levels that are safe for the proposed commercial use. Certain uses will be determined once cleanup is complete.

How were these issues and/or information needs identified?
Based upon previous environmental investigations and NYSDEC/NYSDOH requirements.

Part 2. List important information needed **from** the community, if applicable. Identify individuals, groups, organizations, businesses and/or units of government related to the information needed.

- Adjacent property owners and occupants will be informed of the Site remediation activities. They can reach out to the Site's NYSDEC or NYSDOH project manager if they are concerned about the impact to the surrounding area.
- No activities are taking place at the Site that may need to be restricted. The Site is currently vacant and will remain so until it is remediated and redeveloped.

How were these information needs identified?
- A RI was conducted as part of the environmental redevelopment process of the Site.
- A RIR and an RAWP was prepared and submitted to the NYSDEC for approval. A 45-day Public Comment Period begins once the RIR and the RAWP are submitted. The Final RIR and RAWP are submitted to the NYSDEC, and then the NYSDEC issues the Decision Document, which describes the selected remedy for cleanup of the Site. Remediation can begin after the Decision Document is issued.

- Redevelopment of the Site may begin once the Site remediation is completed.
- Document repositories, where copies of all documents regarding the investigation and remediation of the Site are available to the public, have been established at the Brooklyn Public Library-Highlawn Branch, located at 1664 West 13th Street, at Kings Highway, Brooklyn, NY 11223; and at the Brooklyn Community Board 11, located at 2214 Bath Avenue, Brooklyn, NY 11214

Part 3. List major issues and information that need to be communicated **to** the community. Identify individuals, groups, organizations, businesses and/or units of government related to the issue(s) and/or information.

- A Remedial Investigation (RI) was conducted to determine the nature and extent of on-site contamination, identify the source(s), assess the impact on public health and/or the environment, and support the Remedial Action Work Plan (RAWP) to remediate the Site for redevelopment.
- A RAWP will be submitted to NYSDEC and then NYSDEC will issue the Decision Document, which describes the selected remedy for cleanup of the Site. Remediation can begin after the Decision Document is issued. Redevelopment of the Site may begin concurrently with or following completion of the remedial activities.
- Document repositories, where copies of all documents regarding the investigation and remediation of the Site are available to the public have been established at the Brooklyn Public Library-Highlawn Branch, located at 1664 West 13111 Street, at Kings Highway, Brooklyn, NY 11223; and at the Brooklyn Community Board **11,** located at 2214 Bath Avenue, Brooklyn, NY 11214.

How were these issues and/or information needs identified?
These needs were identified by summarizing the proposed project schedule and information presented in the BCP applications.

Part 4. Identify the following characteristics of the affected/interested community. This knowledge will help to identify and understand issues and information important to the community, and ways to effectively develop and implement the site citizen participation plan (mark all that apply):

a. Land use/zoning at and around site:
☒ **Residential** ☐ **Agricultural** ☐ **Recreational** ☒ **Commercial** ☐ **Industrial**

b. Residential type around site:
☒ **Urban** ☐ **Suburban** ☐ **Rural**

c. Population density around site:
☐ **High** ☒ **Medium** ☐ **Low**

d. Water supply of nearby residences:
☒ **Public** ☐ **Private Wells** ☐ **Mixed**

e. Is part or all the water supply of the affected/interested community currently impacted by the site?
☐ **Yes** ☒ **No**

Provide details if appropriate:

f. Other environmental issues significantly impacted/impacting the affected community?
☐ **Yes** ☒ **No**

Provide details if appropriate:

g. Is the site and/or the affected/interested community wholly or partly in an Environmental Justice Area?
☒**Yes** ☐**No**

h. Special considerations:
☒ **Language** ☐ **Age** ☐ **Transportation** ☐ **Other**

Explain any marked categories in **h: Factsheets must be translated into Chinese.**

Part 5. The site contact list must include, at a minimum, the individuals, groups, and organizations identified in the instructions for **Part 5.** Are other individuals, groups, organizations, and units of government affected by, or interested in, the site, or its remedial program? (Mark and identify all that apply, then adjust the site contact list as appropriate.) – see attached contact list

☒ **Non-Adjacent Residents/Property Owners:**

☒**Local Officials:**

☒**Media:**

☐ **Business/Commercial Interests:**

☐ **Labor Group(s)/Employees:**

☐ **Indian Nation:**

☒ **Citizens/Community Group(s):**.

☒ **Environmental Justice Group(s):**

☐ **Environmental Group(s):**

☐ **Civic Group(s):**

☐ **Recreational Group(s):**

☐ **Other(s):**

Prepared/Updated By: Brian Pendergast **Date:** December 7, 2021

Reviewed Approved By: Click here to enter text. **Date:** Click here to enter text.

	A	B	C	D	E	F	G	H	I	J
1										
2	Site Contact List									
3	Site #: C224307									
4	Site Name: Stillwell Avenue Project Site			List Last Updated: 10-27-21						
5		Name, Title	Address 1	Address 2	Address 3	Street Address	City	State	Zip	Site Name (County)
6	**Local Government Officials**	Hon. Bill de Blasio	NYC Mayor			City Hall	New York	NY	10007	Stillwell Avenue Site (Brooklyn)
7		Hon. Scott Stringer	NYC Comptroller			1 Centre Street	New York	NY	10007	Stillwell Avenue Site (Brooklyn)
8		Hon. Juumane Williams	Public Advocate			1 Centre Street	New York	NY	10007	Stillwell Avenue Site (Brooklyn)
9		Anita Laremont	Commissioner, NYC Dept. of City Planning			120 Broadway, 31st Floor	New York	NY	10271	Stillwell Avenue Site (Brooklyn)
10	**Public Water Supplier**	Vincent Sapienza	Commissioner, NYC Dept. of Environmental Protection			59-17 Junction Boulevard	Flushing	NY	11373	Stillwell Avenue Site (Brooklyn)
11		Mark McIntyre, Director	NYC Office of Environmental Remediation			100 Gold Street - 2nd Floor	New York	NY	10038	Stillwell Avenue Site (Brooklyn)
12		Julie Stein	Office of Environmental Assessment & Planning	NYC Dept. of Environmental Protection		96-05 Horace Harding Expressw	Flushing	NY	11373	Stillwell Avenue Site (Brooklyn)
13		Hon. Eric Adams	Brooklyn Borough President			209 Joralemon Street	Brooklyn	NY	11201	Stillwell Avenue Site (Brooklyn)
14		Meghan Medwid	NYSDEC Project Manager			625 Broadway	Albany	NY	12233	Stillwell Avenue Site (Brooklyn)
15		Thomas V. Panzone	NYSDEC Public Participation Specialist			47-40 21st Street	Long Island City	NY	11101	Stillwell Avenue Site (Brooklyn)
16		TBD	NYSDOH Public Health Specialist		Empire State Plaza	Corning Tower, Room 1787	Albany	NY	12237	Stillwell Avenue Site (Brooklyn)
17		Hon Charles Schumer	U.S. Senator			780 Third Avenue, Suite 2301	New York	NY	10017	Stillwell Avenue Site (Brooklyn)
18		Hon. Kirsten Gillibrand	U.S. Senator			780 Third Avenue, Suite 2601	New York	NY	10017	Stillwell Avenue Site (Brooklyn)
19		Hon. Jerrold Nadler	U.S. House of Representatives			6605 Fort Hamilton Parkway	Brooklyn	NY	11219	Stillwell Avenue Site (Brooklyn)
20		Hon. Kalman Yeger	NYC Councilmember			4424 16th Avenue	Brooklyn	NY	11204	Stillwell Avenue Site (Brooklyn)
21		Hon. Simcha Felder	NYS Senator			1412 Avenue J, Suite 2E	Brooklyn	NY	11230	Stillwell Avenue Site (Brooklyn)
22		Hon. William Colton	NYS Assemblymember			155 Kings Highway	Brooklyn	NY	11223	Stillwell Avenue Site (Brooklyn)
23	**Community Board**	Marnee Elias-Pavia - District Manager	Brooklyn Community Board 11			2214 Bath Avenue	Brooklyn	NY	11214	Stillwell Avenue Site (Brooklyn)
24		William Guarinello - Chairman	Brooklyn Community Board 11			2214 Bath Avenue	Brooklyn	NY	11214	Stillwell Avenue Site (Brooklyn)
25		Antonia Trioa – Environmental Committee	Brooklyn Community Board 11			2214 Bath Avenue	Brooklyn	NY	11214	Stillwell Avenue Site (Brooklyn)
26	**County Clerk**	Nancy T. Sunshine, County Clerk	Kings County Clerk's Office			360 Adams Street, Room 189	Brooklyn	NY	11201	Stillwell Avenue Site (Brooklyn)
27	**Consolidated Edison**	Antonia Yuille - Director	Consolidated Edison Corporate Affairs			30 Flatbush Avenue	Brooklyn	NY	11217	Stillwell Avenue Site (Brooklyn)
28	**NYPD**	Louis Tromboli - President	62nd Police Precinct Council			1925 Bath Avenue	Brooklyn	NY	11214	Stillwell Avenue Site (Brooklyn)
29	**FDNY**	Engine 253	FDNY			2429 86th Street	Brooklyn	NY	11214	Stillwell Avenue Site (Brooklyn)
30	**Local Media Outlets**	New York Daily News				4 New York Plaza	New York	NY	10004	Stillwell Avenue Site (Brooklyn)
31		New York Post				1211 Avenue of the Americas	New York	NY	10036	Stillwell Avenue Site (Brooklyn)
32		Spectrum NY 1 News				75 Ninth Avenue	New York	NY	10011	Stillwell Avenue Site (Brooklyn)
33		Brooklyn Daily Eagle				16 Court Street, 30th Floor	Brooklyn	NY	11241	Stillwell Avenue Site (Brooklyn)
34		World Journal (Chinese)				141-07 20th Avenue	Whitestone	NY	11357	Stillwell Avenue Site (Brooklyn)
35		Sing Tao Daily				5510 8th Avenue, Room 202	Brooklyn	NY	11220	Stillwell Avenue Site (Brooklyn)
36		Courier-Life Publications				1 Metrotech Center #10T	Brooklyn	NY	11201	Stillwell Avenue Site (Brooklyn)
37		The Brooklyn Papers				1 Metrotech Center, 3rd Floor	Brooklyn	NY	11201	Stillwell Avenue Site (Brooklyn)
38	**School and Daycare Facilities**	Gold Material Montessori School	Maksim Kondrukevich			105 Kings Hwy	Brooklyn	NY	11214	Stillwell Avenue Site (Brooklyn)
39		Intermediate School 96	Erin, Lynch, Principal			99 Avenue P	Brooklyn	NY	11204	Stillwell Avenue Site (Brooklyn)
40		PS 97 -The Highlawn	Irina Cabello, Principal			1855 Stillwell Avenue	Brooklyn	NY	11223	Stillwell Avenue Site (Brooklyn)
41		Hebrew Language Academy Charter School 2	Ashley Furan, Head of School			1870 Stillwell Avenue	Brooklyn	NY	11223	Stillwell Avenue Site (Brooklyn)
42		Brooklyn School of Inquiry	Debra Nier, Administrative Secretary			50 Avenue P, 4th Floor	Brooklyn	NY	11204	Stillwell Avenue Site (Brooklyn)
43		Success Academy	Kerri Lynch, Principal			99 Avenue P, Floor 4	Brooklyn	NY	11204	Stillwell Avenue Site (Brooklyn)
44		PS 128 Bensonhurst	Jessica Drzewucki, Principal / Administrator			2075 4th Street	Brooklyn	NY	11214	Stillwell Avenue Site (Brooklyn)
45		Sinai Academy Junior High and High School				2025 79th Street	Brooklyn	NY	11214	Stillwell Avenue Site (Brooklyn)
46		St. Peter Catholic Academy	Rabbi Aryeh Katzin			8401 23rd Avenue	Brooklyn	NY	11214	Stillwell Avenue Site (Brooklyn)
47		Atidaynu - Our Future School, LLC	Simi Bazov, Principal			7914 Bay Parkway	Brooklyn	NY	11214	Stillwell Avenue Site (Brooklyn)
48		Stillwell Avenue Prep & Nursery	Candy Juba, Executive Director			1990 Stillwell Avenue	Brooklyn	NY	11223	Stillwell Avenue Site (Brooklyn)
49		Brooklyn Studio Secondary School	Andrea Cilliotta, Principal			8310 21st Avenue	Brooklyn	NY	11214	Stillwell Avenue Site (Brooklyn)
50		Magen David Yeshivah Celia Esses High Schoo	Rabbi Saul Zucker, Principal			7801 Bay Parkway	Brooklyn	NY	11214	Stillwell Avenue Site (Brooklyn)
51		Edith and Karl Marks JCH of Bensonhurst				7802 BAY PARKWAY	Brooklyn	NY	11214	Stillwell Avenue Site (Brooklyn)
52	**Community, Civic, Religious and Other Environmental Organizations**									Stillwell Avenue Site (Brooklyn)
53		Asian Chinese United Society				1884 86th Street	Brooklyn	NY	11214	Stillwell Avenue Site (Brooklyn)
54		Brooklyn Chinese American Association				6701 20th Avenue	Brooklyn	NY	11204	Stillwell Avenue Site (Brooklyn)
55		Federation of Italian American Organizations				8711 18th Avenue	Brooklyn	NY	11204	Stillwell Avenue Site (Brooklyn)
56		National Federation – Italian American Societies				7704 17th Ave	Brooklyn	NY	11214	Stillwell Avenue Site (Brooklyn)
57		United Chinese Association				1787 Stillwell Ave	Brooklyn	NY	11223	Stillwell Avenue Site (Brooklyn)
58	**Adjacent Properties**	Goodview LLC				1663 Stillwell Avenue	Brooklyn	NY	11223	Stillwell Avenue Site (Brooklyn)
59		Greenview Queens Realty LLC				126-136 Kings Hwy	Brooklyn	NY	11229	Stillwell Avenue Site (Brooklyn)
60		Peter Konstas/Maria Konstas				1677 Stillwell Avenue	Brooklyn	NY	11223	Stillwell Avenue Site (Brooklyn)
61		Anchor Equity Holding LLC				1672-1674 West 13th Street	Brooklyn	NY	11223	Stillwell Avenue Site (Brooklyn)
62		Brooklyn Public Library				1664-1670 West 13th Street	Brooklyn	NY	11223	Stillwell Avenue Site (Brooklyn)
63		Gao Ming Yang				2271 78th Street	Brooklyn	NY	11214	Stillwell Avenue Site (Brooklyn)
64		Yan Fen Yang				2271 78th Street	Brooklyn	NY	11214	Stillwell Avenue Site (Brooklyn)
65		Zheng Jian				2271 78th Street	Brooklyn	NY	11214	Stillwell Avenue Site (Brooklyn)
66										