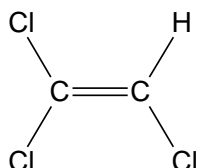


TRICHLOROETHYLENE

CAS Number: 79-01-6
Synonyms: 1,1,2-trichloroethylene, ethylene trichloride, trichlor, TCE
Chemical Formula: C_2HCl_3
Molecular Weight: 131.40
Chemical Structure:



Refer to the Safety Data Sheet (SDS) for additional information and before handling this material.

Description: Trichloroethylene is a clear, colorless liquid at room temperatures. It is volatile, has a sweet odor, and is completely miscible with most organic liquids.

Product Overview

Trichloroethylene is a versatile, chlorinated solvent used in many industries. It is a useful organic solvent, and has no flash or fire point. It is stable and non-corrosive. Axiall Corporation produces trichloroethylene at the Lake Charles, Louisiana plant. With over 60 years of responsible production and handling experience, Axiall manufactures trichloroethylene with environmental and public safety consideration. Axiall personnel are experienced in handling and shipping trichloroethylene, and our engineers, scientists, and sales personnel can provide technical assistance to users.

Trichloroethylene is a relatively non-flammable, multipurpose chlorinated solvent with high stability and solvency. Its inherent stability is further enhanced by Axiall's stabilizer system, which can be customized to fit many applications. Trichloroethylene has no flash or fire point, lending it important safety strengths over petroleum distillates. As a result, combined with its other desirable chemical and physical properties, trichloroethylene offers many advantages over other solvents.

Production

Axiall produces trichloroethylene through the high temperature oxyhydrochlorination of chlorinated hydrocarbons. Vaporized chlorinated organics are mixed with hydrochloric acid and oxygen inside a catalytic fluidized bed reactor where a series of chlorination and thermal cracking reactions occur. The overall exothermic reaction is carefully controlled to maintain the required temperature. The resulting product is a blend of trichloroethylene and perchloroethylene, which is distillation separated. Trichloroethylene is then further purified by distillation and stabilized to prevent oxidation.

Uses

Trichloroethylene has many properties that make it the right choice as a solvent. It has high stability, solvency, boiling point, and vapor density. It has a low specific heat, heat of vaporization, and cloud point. It is relatively non-flammable and has no flash or fire point.

Axiall's trichloroethylene incorporates an effective stabilizing system making it ideal for use as a vapor degreaser. The stabilizers help to prevent solvent breakdown caused by contaminants like acids, alkalis, metal

chips and fines, and exposure to oxygen, light, and heat. They also protect the parts and equipment during vapor degreasing and cleaning. Axiall's trichloroethylene efficiently degreases metals without staining or pitting.

Axiall's stabilizer system is neutral and uses catalytic regeneration to help prevent solvent decomposition. It includes ingredients to deactivate the effects of metallic contaminants and includes antioxidants to protect against degradation. Additionally, it helps maintain a constant pH and provides resistance to sludge formation making it ideal for vapor degreasing and metal cleaning.

With all downstream applications, appropriate registrations and/or approvals may be required. Possible uses are described below:

- **Vapor Degreasing** - Trichloroethylene is used primarily for vapor degreasing zinc, aluminum, brass, bronze, and steel parts during fabrication. Specialty grades are available for a variety of applications.
- **Metal Fabrication** - Many industries, including aerospace, automotive, and household appliance production, use trichloroethylene in vapor degreasing for metal parts to remove soil and metal chips during fabrication. It is also used for cold cleaning in painting processes.
- **Metal Cleaning** - Trichloroethylene is a primary solvent for cleaning aluminum and is second only to alkalis for sheet and strip steel cleaning prior to galvanizing. Trichloroethylene degreases more thoroughly and several times faster than alkaline cleaners and requires smaller equipment that consumes less energy.
- **Polymers** - Trichloroethylene serves as a chain transfer agent in the production of polyvinyl chloride.
- **Aerospace** - Trichloroethylene is used to flush out reservoirs and piping for liquid oxygen (LOX) and liquid hydrogen tanks.
- **Refrigerants** - Trichloroethylene is used as a feedstock in the manufacture of mobile air refrigerants and other fluorinated chemical compounds.

Product Grades

Axiall Corporation offers a number of specialty grades of trichloroethylene, suited for a variety of applications. These grades are described below:

- **Standard Degreasing and General Solvent** - This grade is stabilized for general, heavy-duty vapor degreasing and cold cleaning applications. To Axiall's knowledge, this grade meets the requirements of ASTM D4080.
- **Dual-Purpose** - This grade is a fully stabilized, low-residue product which may be used for LOX flushing, vapor degreasing, and cleaning electronic components. If requested, this grade could be produced to meet the requirements of ASTM D4080.
- **High Purity** - This is a low-residue solvent, formulated specifically for cleaning critical electronic components and LOX flushing. It is also suitable as a chemical intermediate. This grade should not be used for vapor degreasing.
- **Fluorocarbon** - This grade is used as the feedstock for the manufacture of mobile refrigerant, medicinal inhalants, foam blowing agents, and other fluorinated chemical compounds.

Health Effects

Read and follow all instructions on the product label and review the Safety Data Sheet (SDS) to understand and avoid the hazards associated with trichloroethylene. Wear appropriate personal protective equipment and avoid direct contact. Eye contact with trichloroethylene causes serious eye irritation. Skin contact with trichloroethylene causes skin irritation. Ingestion of trichloroethylene may be harmful if swallowed. Trichloroethylene may be aspirated into lungs during ingestion and/or subsequent vomiting; aspiration of this

material will cause severe lung injury, chemical pneumonitis, pulmonary edema or death. Inhalation of trichloroethylene may be harmful and may affect the central nervous system; symptoms may include dizziness, drowsiness, lethargy, coma and death. Adrenaline should only be administered after careful consideration following overexposure to trichloroethylene; increased sensitivity of the heart to adrenaline may be caused by overexposure to this product.

Chronic overexposure to trichloroethylene may cause damage to the liver and kidneys as well as immunological effects. Trichloroethylene has been evaluated as to its carcinogenic potential in several cancer studies in rodents. These carcinogenicity studies indicate an increased incidence of kidney (renal) tumors in rats and an increased incidence of liver and lung tumors in mice with some reports of tumors at other sites. Epidemiological studies conducted on workers exposed occupationally suggest a possible association between exposure to trichloroethylene and kidney (renal) cancer. At the present time the International Agency for Research on Cancer (IARC) lists trichloroethylene in Group 1, as a substance considered “carcinogenic to humans.” It is strongly suggested that trichloroethylene customers review their industrial hygiene programs and institute good operating practices designed to limit employee exposure below the established airborne exposure limits.

The United States Occupational Safety and Health Administration (OSHA) and the American Conference of Governmental Industrial Hygienists® (ACGIH) have established or recommended occupational airborne exposure limits for trichloroethylene. The OSHA Permissible Exposure Limit (PEL) is an 8-hour time-weighted average (TWA) of 100 ppm. OSHA’s limits also include Ceiling Limit of 200 ppm for 15 minutes. The ACGIH currently recommends a Threshold Limit Value (TLV) of 10 ppm for 8-hour TWA and 25 ppm for a 15-minute STEL, a short term exposure limit.

Depending on conditions, trichloroethylene or its vapors, when in contact with flames, hot glowing surfaces or electric arcs, can decompose to form hydrogen chloride gas, which is highly irritating to the nose and throat, as well as trace levels of phosgene gas, an extremely poisonous gas, may be produced.

Before handling, it is important that engineering controls are operating and protective equipment requirements and personal hygiene measures are being followed. People working with this chemical should be properly trained regarding its hazards and its safe use and should be given the opportunity to review this document and the safety data sheet.

Environmental Effects

Trichloroethylene should be kept out of lakes, streams, ponds, or other water sources. Trichloroethylene shows a low bioaccumulation potential.

Exposure Potential

Precautions should be taken to minimize potential harm to people, animals, and the environment. Potential for exposure may vary depending upon site-specific conditions. When handling trichloroethylene, always refer to the Safety Data Sheet and Product Warning Label and follow all instructions and warnings. Based on the expected uses for trichloroethylene, exposure could be through:

- **Workplace exposure** - Exposure can occur either in a trichloroethylene manufacturing facility or in the various industrial facilities that use trichloroethylene. Good industrial hygiene practices and the use of personal protective equipment will, when combined with proper training and environment, health and safety practices, contribute to a safe work environment.
- **Environmental releases** - In the event of a spill, contain the spill to prevent contaminated soil, surface or ground water. Industrial spills (releases to soil or water) should be controlled by workplace spill

programs which include containment around loading and unloading operations and storage tanks and employee training. Many aspects of a spill control program are mandated by federal, state and local requirements. In addition, if a spill occurs, governmental reporting may be required. Refer to the Safety Data Sheet for instructions to contain and clean up a spill to minimize exposure.

- **Consumer exposure** - Trichloroethylene is not sold directly to consumers, however it is an ingredient in some consumer products. Keep all chemical products out of the reach of children.

Safe Handling and Storage

As tested by standard methods, trichloroethylene has no flash point or fire point. Trichloroethylene vapor concentrations between 7.8% and 52% by volume in air are explosive by ignition. Depending upon conditions, this material or its vapors when in contact with flames, hot glowing surfaces or electric arcs can decompose to form hydrogen chloride gas and possible traces of phosgene. Fire and explosion hazards can be minimized by adequate ventilation, using the proper types and arrangement of equipment, and reasonable precautions and care in handling.

Trichloroethylene should be stored away from direct sunlight in a dry, cool and well-ventilated area away from incompatible materials. It should not be stored above 35°C (95°F). Depending on conditions, when trichloroethylene is exposed to high temperatures, heat, or ignition, hydrogen chloride gas, which is highly irritating to the nose and throat, as well as trace levels of phosgene gas, an extremely poisonous gas, may be produced. As a result, all ignition sources should be eliminated. All metal parts of equipment must be grounded to avoid ignition of vapors by static electricity discharge.

Avoid contact with strong alkalis, such as caustic soda, strong acids, and oxidizing agents. Contact of trichloroethylene with aluminum must be avoided because solvent decomposition can occur.

Appropriate personal protective equipment, as described in the trichloroethylene Safety Data Sheet, should always be worn to avoid contact with the eyes, skin and clothing or to prevent the inhalation of the gas, fumes or vapor.

Trichloroethylene may be added to certain proprietary solvent blends to increase their flash points and solvency. However, the amount of trichloroethylene added must be sufficient to increase the flash point because, if an insufficient amount of trichloroethylene is added, the flash point of the blend may actually be lowered. Therefore, before selling or using a proprietary blend made with trichloroethylene or other chlorinated solvents, actual flash points or fire points of the blend should be determined.

Packaging and Shipping

Axiall ships trichloroethylene primarily in tank trucks, tank cars, and 55 gallon drums.

- **Drums** - Shipments of trichloroethylene are packaged in 55 gallon drums and shipped in trucks or ships.
- **Tank car** - Single compartment rail cars are available with capacities of 10,000 and 20,000 gallons.
- **Tank trucks** - Axiall ships trichloroethylene in bulk tank trucks with a capacity of 20 tons.
- **Barges** - Axiall ships trichloroethylene in barges that range from 1,000 to 1,500 tons.
- **Ships** - Axiall ships trichloroethylene in ocean going vessels of several million pounds.

Fire and Explosion Hazards

Trichloroethylene by itself is non-flammable and not explosive. Trichloroethylene has no flash or fire point as tested by standard methods. Since vapors are heavier than air, they will spread along the ground and may accumulate in low or confined areas.

During a fire, promptly isolate the scene by removing all persons from the vicinity of the incident. No other action shall be taken without suitable training. Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Physical and Chemical Properties

Trichloroethylene is a chlorinated 2-carbon solvent. It is a suitable solvent for organic compounds that do not dissolve well in hydrocarbons, polar solvents, and many organic materials. Chlorinated hydrocarbons tend to decompose when exposed to light, heat, oxygen, or water. This decomposition process is accelerated by the presence of metals and metal salts, and the presence of the decomposed solvent itself tends to catalyze further decomposition. To maximize stability, Axiall stabilizes trichloroethylene solvents prior to shipment.

Properties of Trichloroethylene	
Boiling Point	188.4°F (86.9°C)
Freezing Point	-123.5°F (-86.4°C)
Auto-ignition temperature	788°F (420°C)
Specific Gravity at 20°C	1.465
Vapor Pressure at 20°C	57.8 mm Hg
Density at 20°C	12.2 lbs/gal

Regulatory Information

The trichloroethylene Safety Data Sheet contains regulatory information, including Chemical Inventory Status, California Proposition 65 status, and Transportation Classifications. The following is additional regulatory information.

North American Regulatory Information

- **CONEG Regulation/Model Toxics in Packaging Legislation** - Lead, cadmium, mercury and hexavalent chromium are not intentionally added to trichloroethylene, and based on the formula and Axiall's experience with the product, the sum of the incidental concentration levels of these metals is not expected to exceed 100 parts per million (ppm) by weight.
- **RCRA** – Commercial grade trichloroethylene, if discarded or spilled, would be a listed hazardous waste under 40 CFR 261.33, specifically U228 – trichloroethylene CAS 79-01-6. In addition, trichloroethylene, if discarded or spilled, as well as other wastes generated during use of trichloroethylene or containing trichloroethylene may exhibit one or more hazardous waste characteristics under 40 CFR 261.24, including D040 – toxic. (Note: Axiall provides information on U.S. hazardous waste criteria for the product as manufactured. It remains the obligation of the user

to evaluate their specific waste and to manage, treat, and dispose of unused material, residues, and containers in accordance with applicable federal, state, and local requirements.)

- **TSCA Significant New Use Rule** - Pursuant to the Toxic Substance Control Act (TSCA), EPA has issued a Significant New Use Rule (SNUR) for trichloroethylene (TCE), CAS 79-01-6. See 40 CFR 721.10851. The significant new use is the manufacture or processing for use in a consumer product, with an exception for use of TCE in cleaners and solvent degreasers, film cleaners, hoof polishes, lubricants, mirror edge sealants, and pepper spray.
- **VOC Information** - Trichloroethylene contains volatile organic compounds (VOC) as defined in 40 CFR 51.100.
- **HAP Information** - Trichloroethylene is a hazardous air pollutant (HAP) as listed in the Clean Air Act Amendments of 1990, 42 USC 7412 (b).
- **Ozone-Depleting Chemicals** - Trichloroethylene is not/does not contain ozone depleting chemicals (40 CFR 82, Subpart A, Appendix F).
- **Toxic Pollutants / Priority Pollutants** - Trichloroethylene contains toxic pollutants/priority pollutants as listed in 40 CFR 401.15.
- **CERCLA Hazardous Substance** - Trichloroethylene appears in the List of Hazardous Substances and Reportable Quantities table (40 CFR 302.4) with a reportable quantity (RQ) of 100 pounds (45.4 Kg).
- **TSCA Information** - Trichloroethylene is not currently subject to any rule or order under TSCA Sections 4,5,7,8(a), or 8(d).

Other Regulatory Information

- **RoHS/WEEE** - Trichloroethylene has been reviewed with regard to the EU Directive 2011/65/EU “Restriction on the Use of Certain Hazardous Substances” (RoHS 2). Based on our knowledge of this product and information on the raw material suppliers’ Safety Data Sheets, this product does not contain cadmium, hexavalent chromium, lead, mercury, polybrominated biphenyls (PBBs) or polybrominated diphenyl ethers (PBDEs) at levels greater than the tolerated maximum concentration values established by the directive.

Additional Product Information

- **Source** - Trichloroethylene is derived from mineral and petroleum sources and has not been derived from plant, animal, synthetic or fermentation sources.
- **Allergenic Materials** - Trichloroethylene is not manufactured using any of the following allergenic materials: carmine/cochineal extracts, celery, colors/color additives, dyes/food dyes, eggs/egg products, seafood/fish/shellfish/crustaceans, flavors, glutens, legumes, milk, mollusks, monosodium glutamate (MSG), mustards, plant nuts/seeds/oils (sesame, sunflower, safflower, canola, etc.), peanuts/peanut products, protein hydrolysates, soy/soybeans/soybean products, spices, sulfites, sulfates, tree nuts/tree nut oils and wheat.
- **Bovine Spongiform Encephalopathy** - Trichloroethylene is not of animal origin, and, to Axiall’s knowledge, does not contribute to Transmissible Spongiform Encephalopathy (TSE)/Bovine Spongiform Encephalopathy (BSE).
- **Genetically Modified Organisms (GMOs)** - Trichloroethylene is not manufactured with and does not contain genetically modified organisms.
- **Natural Latex Rubber** - Trichloroethylene is not manufactured with and does not contain natural latex rubber as defined in 21 CFR 801.437(b)(1).
- **Nutritional Value** - Trichloroethylene does not have nutritional value.

Product Stewardship

Axiall Corporation is committed to managing trichloroethylene so that it can be safely used by its employees and customers. Axiall's relationships with its customers encourage communication about safety and environmental stewardship.

Additional Information

For more information regarding Axiall's trichloroethylene, contact our customer service department by calling 800-243-6774.

References

- Axiall Corporation Web page: <http://www.axiall.com/>
- Axiall Safety Data Sheets: <http://www.axiall.com/products/safety-data-sheets/>

Notice

Prior to its use, the user is responsible for determining the suitability of the product or products covered by this Product Stewardship Summary and for complying with all federal, state, and local laws and regulations in connection with its use. Neither Axiall Corporation nor any of its affiliates shall be responsible for any damages of any kind whatsoever resulting from the use of or reliance on this Product Stewardship Summary or product or products to which it refers.

This Product Stewardship Summary is intended only to provide a general summary of the potential hazards associated with the product or products described herein. It is not intended to provide detailed information about potential health effects and safe use and handling information and, although Axiall Corporation believes this information is correct, Axiall Corporation makes no warranties as to its completeness or accuracy. Appropriate literature has been assembled which provides information concerning the health and safety precautions that must be observed when handling the Axiall Corporation product(s) mentioned in this document. Before working with any of these products, users must read and become familiar with the available information on product hazards, proper use, and handling. Information is available in several forms, such as safety data sheets (SDS) and product labels. A copy of Axiall's SDS for trichloroethylene can be obtained by going to the company's website www.axiall.com.

This information is subject to change without notice.

Issue Date: October 2016