

## Product Stewardship Summary Carbon Tetrachloride

### Summary

Carbon tetrachloride is a colorless liquid with a sweet smell that can be detected at low levels. Its chemical formula is CCl<sub>4</sub>. Carbon tetrachloride is used in industrial applications.

### 1. Chemical Identity

Name: carbon tetrachloride

Synonyms: tetrachloromethane, methane tetrachloride, perchloromethane, benzoinform

Chemical Abstracts Service (CAS) number: 56-23-5

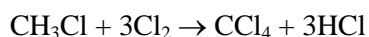
Chemical Formula: CCl<sub>4</sub>

Molecular Weight: 153.82

Carbon tetrachloride is a colorless liquid. It has a sweet odor, and is practically nonflammable at ambient temperatures.

### 2. Production

Carbon tetrachloride can be manufactured by the chlorination of methyl chloride according to the following reaction:



Carbon tetrachloride can also be formed as a byproduct of the manufacture of chloromethanes or perchloroethylene.

OxyChem manufactures carbon tetrachloride at facilities in Geismar, Louisiana and Wichita, Kansas.

### 3. Uses

OxyChem does not sell carbon tetrachloride to household consumers.

Prior to the Montreal Protocol, carbon tetrachloride was used to manufacture Freon refrigerants. However, these refrigerants are thought to contribute to ozone depletion and have been phased out. Carbon tetrachloride is considered an ozone depleting substance, and most emissive uses (uses that do not result in the transformation or destruction of the substance) have been banned in developed countries since 1995. Emissive uses will be banned in developing countries by 2010.

Currently, carbon tetrachloride is used in essential pharmaceutical and agrochemical applications. Carbon tetrachloride is also used as a raw material or processing agent for the manufacture of other chemicals and products.

#### **4. Physical and Chemical Properties**

Carbon tetrachloride is practically nonflammable at ambient temperatures. However, when subjected to high temperatures, it can decompose to form hydrogen chloride, chlorine or phosgene.

Carbon tetrachloride is a volatile liquid, meaning that it evaporates quickly. Containers of carbon tetrachloride should be tightly closed whenever they are not in use to prevent evaporation of the liquid. Carbon tetrachloride can be stored in vessels made of common materials of construction. It is stable with common metals other than aluminum and aluminum alloys. It should be stored away from peroxides and other oxidizing materials to avoid reactions.

#### **5. Health Effects**

##### Inhalation

Because carbon tetrachloride is a volatile liquid, inhalation is the main route of exposure. It may cause respiratory tract irritation, dizziness, loss of coordination, and nausea. Breathing excessively high concentrations can have a direct sensitizing effect on the heart which can lead to irregular heartbeats and even death. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material.

Drinking alcohol may increase the potential for toxic effects.

Chronic overexposure to carbon tetrachloride can lead to liver and kidney damage.

##### Eye Contact

Vapors may cause mild irritation with tearing, redness, or a stinging or burning feeling. Liquids or mists may cause severe irritation with redness and pain.

##### Skin Contact

Prolonged contact may cause irritation with redness, an itching or burning feeling, and swelling. Carbon tetrachloride may be absorbed through the skin and may cause effects similar to those described for inhalation.

##### Ingestion

Carbon tetrachloride may be harmful or fatal if swallowed. If swallowed, do not induce vomiting. Carbon tetrachloride is a lung aspiration hazard. Aspiration can lead to chemical pneumonitis, pulmonary edema, damage to the lung tissue, or death.

##### Cancer Studies

The National Toxicology Program (NTP) classifies carbon tetrachloride as an Anticipated Human Carcinogen. The International Agency for Research on Carcinogens (IARC) places carbon tetrachloride in Group 2B. Compounds in Group 2B have sufficient evidence of carcinogenicity in animals and inadequate human evidence of carcinogenicity. Carbon tetrachloride has caused liver tumors in rodents that were exposed to it by inhalation and by ingestion.

##### Reproductive Studies

Data from animal studies suggest that the potential for reproductive or developmental effects is low.

## **6. Environmental Effects**

If released to land, carbon tetrachloride is expected to evaporate rapidly from soil due to its high vapor pressure. It is highly mobile in soil, and it may travel to underground water sources. Volatilization from moist soil surfaces into the air is expected to be an important process. The potential for volatilization from dry soil surfaces also exists based on the vapor pressure.

When carbon tetrachloride is released to surface water, its primary loss will be by volatilization. The volatilization half-life for a model river is 3.7 hours. Adsorption to suspended solids and sediment is not expected.

When released to air, carbon tetrachloride will exist as a vapor in the atmosphere. It is stable in the troposphere with a residence time of 30 to 50 years.

Carbon tetrachloride has exhibited moderate toxicity in fish. This compound is not expected to bioconcentrate in aquatic organisms.

## **7. Exposure**

The most likely ways exposures could occur are:

- Worker exposure – Exposure could occur in the manufacturing facility or in industrial facilities that use carbon tetrachloride. Exposures could occur by inhalation of vapors or by skin contact. Carbon tetrachloride is used in closed systems in manufacturing processes to minimize exposures. In addition, good industrial hygiene practices and personal protective equipment minimize the risk of exposure.
- Consumer exposure – OxyChem does not sell carbon tetrachloride for use directly in consumer products.
- Releases – If a spill occurs, emergency personnel should wear protective equipment to minimize exposures.

## **8. Recommended Risk Management Measures**

Carbon tetrachloride can react with certain materials of construction. In addition, personnel exposure must be controlled. Prior to using carbon tetrachloride, carefully read and comprehend the Material Safety Data Sheet. The following are some risk management measures that are effective against these hazards:

- Work areas where carbon tetrachloride is used should be well ventilated to limit solvent vapors to below exposure limits.
- To avoid overexposure to carbon tetrachloride vapors, monitor the vapor concentration in the work place. If vapors are above exposure limits, install additional engineering controls (such as localized ventilation) to reduce vapor concentrations to safe operating levels.
- To prevent eye contact, protective eye wear (such as splash goggles, a full face shield, or safety glasses with side shields) must be worn.

- To prevent skin contact, wear protective clothing (including compatible gloves) when working with carbon tetrachloride.
- Proper labeling, handling and storage of carbon tetrachloride will reduce the likelihood of accidental exposure.
- Equipment used for carbon tetrachloride storage or processing should be constructed of the proper materials. For example, bulk storage containers should be constructed of either mild carbon, or stainless steel. Do not use aluminum as a material of construction. Carbon steel is the material of choice for piping.
- Personnel involved with carbon tetrachloride manufacturing operations should be properly trained.

## 9. Regulatory Compliance Information

The following is a summary of regulations and guidelines that may pertain to carbon tetrachloride (additional regulations and guidelines may apply):

Consumer Product Safety Commission: Carbon tetrachloride and mixtures containing it (with the exception of chemicals containing unavoidable residues of carbon tetrachloride that do not result in concentrations of carbon tetrachloride greater than 10 ppm) are banned in consumer products.

### U.S. Environmental Protection Agency:

- Clean Air Act: Carbon tetrachloride is included on the Clean Air Act, Section 112(b) list of Hazardous Air Pollutants.
- Clean Water Act: Carbon tetrachloride is included on the Clean Water Act, Section 126 list of Priority Pollutants.
- Comprehensive Environmental Response, Compensation, and Liability Act: Releases of carbon tetrachloride in excess of the Reportable Quantity of 10 pounds must be reported.
- Emergency Planning and Community Right-to-know Act: Carbon tetrachloride is a listed substance that is subject to reporting requirements under Section 313 of the act. These reports are often called Toxic Release Inventory (TRI) Reports.
- Resource Conservation and Recovery Act: Listed Hazardous Waste Codes in which listing is based wholly or partly on carbon tetrachloride include U211, D019, F001, F024, F025, K016, K019, K020, K021, K073, K116, K150, K151, and K157.

### Occupational Safety and Health Administration - Permissible Exposure Limits:

- 8 hour time weighted average: 10 ppm
- Ceiling: 25 ppm
- Peak (5 minutes in any 3 hour period): 200 ppm

### American Conference of Governmental Industrial Hygienists - Threshold Limit Values

- 8 hour time weighted average: 5 ppm
- Short Term (15 minute average): 10 ppm

### National Institute for Occupational Safety and Health – Recommended Exposure Levels:

- Immediately Dangerous to Life and Health concentration: 200 ppm

## 10. Sources for Additional Information

ACGIH, Carbon tetrachloride. In: Documentation of the threshold limit values for substances in workroom air. 3rd ed. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, pp. 4344, 1971.

ATSDR, Toxicological Profile for Chloromethane, December 1994.

HSDB, Hazardous Substances Databank Number: 53, Last Revision Date: 20050624.

IARC. 1972. Some Inorganic Substances, Chlorinated Hydrocarbons, Aromatic Amines, *N*-Nitroso Compounds and Natural Products. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Humans, vol. 1. Lyon, France: International Agency for Research on Cancer.

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IARC. 1999. Re-evaluation of Some Organic Chemicals, Hydrazine, and Hydrogen Peroxide. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Humans, vol. 71. Lyon, France: International Agency for Research on Cancer.

IUCLID Dataset, Carbon Tetrachloride, Substance ID: 56-23-5, February 18, 2000.

NIOSH, Carbon Tetrachloride, IDLH Documentation, August 16, 1996.

NTP, Report on Carcinogens, Eleventh Edition; U.S. Department of Health and Human Services, Public Health Service, National Toxicology Program.

OxyChem Material Safety Data Sheet web site: <http://msds.oxy.com/>

Reprotox, Reprotox Record Number: 1968, Last Revision Date: December 1, 2008.

RTECS, RTECS Number: FG4900000, Review Date: 200908.

UNEP, Montreal Protocol on Substances that Deplete the Ozone Layer: 2006 Assessment Report of the Technology and Economic Assessment Panel, United Nations Environment Program, March 2007.

**11. Contact Information:** For additional information, call 1-800-752-5151 or 1-972-404-3700.

**12. Preparation Date:** December 2, 2009

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