Product Stewardship Summary
Carbon Tetrachloride

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Summary

This Product Stewardship Summary is intended to give general information about Carbon Tetrachloride. It is not intended to provide an in-depth discussion of all health and safety information about the product or to replace any required regulatory communications.

Carbon tetrachloride is a colorless liquid with a sweet smell that can be detected at low levels; however, odor is not a reliable indicator that occupational exposure levels have not been exceeded. Its chemical formula is CC14. Most emissive uses of carbon tetrachloride, a "Class I" ozone-depleting substance (ODS), have been phased out under the Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol). Certain industrial uses (e.g. feedstock/intermediate, essential laboratory and analytical procedures, and process agent) are allowed under the Montreal Protocol.

1. Chemical Identity

Name: carbon tetrachloride
Synonyms: tetrachloromethane, methane tetrachloride, perchloromethane, benzinoform
Chemical Abstracts Service (CAS) number: 56-23-5
Chemical Formula: CC14
Molecular Weight: 153.8

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:

CH3C1+ 3C12 —> CC14 + 3HC1

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

The use of carbon tetrachloride in consumer products is banned by the Consumer Product Safety Commission (CPSC), under the Federal Hazardous Substance Act (FHSA) 16 CFR 1500.17.

Although carbon tetrachloride is used for some chemical process reactions today, prior to the Montreal Protocol large quantities of carbon tetrachloride were used to produce the refrigerants R-11 (trichlorofluoromethane) and R-12 (dichlorodifluoromethane). However, these refrigerants are believed to play a role in ozone depletion and have been phased out. Carbon tetrachloride is tightly controlled under the Montreal Protocol as an ozone-depleting substance (ODS). As a result of the Montreal Protocol and the Clean Air Act, most uses of this and other ODSs were banned in developed economies around the world in 1995.

Currently, carbon tetrachloride is 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, with the exception of aluminum, magnesium, zinc, and their alloys, as flammable hydrogen gas may be generated. In addition, fittings or transfer lines made of these materials should not be used. It should be stored away from peroxides and other oxidizing materials to avoid reactions.

5. Health Effects

<u>Inhalation</u>
Because carbon tetrachloride is a volatile liquid, inhalation is the main route of exposure. Central Nervous System (CNS) effects are characteristic following inhalation and can range from lightheadedness at low level exposures to loss of consciousness at high levels. CNS effects are an early warning that exposure to high levels has occurred and there is risk of cardiac effects (palpitations, low blood pressure, arrhythmia, arrest). CNS effects include the following symptoms: abdominal pain, nausea, vomiting, headache, lightheadedness, blurry or double vision, personality changes, weakness, slurred speech, stupor, incoordination (disequilibrium, ataxia), coma, and respiratory arrest.

Drinking alcohol may increase the potential for toxic effects.

Delayed pulmonary edema has been reported as long as 8 days after the initial intoxication associated with renal failure. Chronic overexposure to carbon tetrachloride can lead to liver, kidney, and blood 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
Reproductive effects have been reported in animals to include ovary changes in female mice and increase in testicular weights in male mice when exposed by inhalation during long term exposure studies. Data from animal studies suggest that the potential for developmental effects is low. Carbon tetrachloride may cross the placenta and may be excreted in breast milk.

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. It is subject to photolysis in the stratosphere and considered an ODS.

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. However, manufacturing and industrial facilities are subject to stringent EPA regulations that limit emissions. 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 —The use of carbon tetrachloride in consumer products is banned by CPSC under federal law (FHSA).
- Releases — If a spill occurs, emergency personnel should wear personal 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 Safety Data Sheet (SDS). The following are some risk management measures that are effective against these hazards:

- Work areas where carbon tetrachloride is used must use engineering controls 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. In addition, Carbon Tetrachloride is identified as ODS under Section 604 of the Clean Air Act. Products containing or manufactured with ODS must be specially labeled identifying the presence of an ODS. The Clean Air Act also requires EPA to identify alternatives for ODS and to publish lists of acceptable and unacceptable substitutes. The program, the Significant New Alternatives Policy (SNAP), list methylene chloride and perchloroethylene as acceptable replacements for carbon tetrachloride.
- 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 MAXIMUM PEAK in any 4 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. 43 - 44, 1971.

ATSDR, Toxicological Profile for Carbon Tetrachloride, August 2005.

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.

IARC. 1979. Some Halogenated Hydrocarbons. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Humans, vol. 20. Lyon, France: International Agency for Research on Cancer.

IARC. 1982. Chemicals, Industrial Processes and Industries Associated with Cancer in Humans. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Humans, Supplement 4. Lyon, France: International Agency for Research on Cancer.

IARC. 1987. Overall Evaluations of Carcinogenicity. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Humans, Supplement 7. Lyon, France: International Agency for Research on Cancer.

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.

Integrated Risk Information System (IRIS), U.S. EPA National Center for Environmental Assessment: Chemical Assessment Summary: Carbon Tetrachloride, March 31, 2010.

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

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

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

Company SDS web site:
http://www.oxy.com/OurBusinesses/Chemicals/Products/Pages/SDS.aspx

Product Information on Company web site:
http://www.oxy.com/OurBusinesses/Chemicals/Products/Pages/Chlorine-and-Derivatives.aspx

Reprotox, Reprotox Record Number: 1968, Last Revision Date: November 23, 2016.

RTECS, RTECS Number: FG4900000, Review Date: 201610.

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.

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