

# MATERIAL SAFETY DATA SHEET

## SECTION 1. PRODUCT IDENTIFICATION

**PRODUCT NAME:** Silicon Tetrachloride

**CHEMICAL NAME:** Silicon Tetrachloride **FORMULA:** SiCl<sub>4</sub>

**SYNONYMS:** Tetrachlorosilane, Silicon Chloride

**MANUFACTURER:** Air Products and Chemicals, Inc.

7201 Hamilton Boulevard

Allentown, PA 18195-1501

**PRODUCT INFORMATION:** (800) 752-1597

**MSDS NUMBER:** 1063 **REVISION:** 4

**REVIEW DATE:** December 1998 **REVISION DATE:** December 1998

## SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

Silicon Tetrachloride is sold as pure product (>99%).

**CAS NUMBER:** 10026-04-7

**EXPOSURE LIMITS:**

**OSHA:** None established **ACGIH:** None established **NIOSH:** None established

Silicon Tetrachloride hydrolyzes to hydrochloric acid on contact with moisture. ACGIH recommends a

5 ppm Ceiling limit for hydrogen chloride.

## SECTION 3. HAZARD IDENTIFICATION

### EMERGENCY OVERVIEW

Silicon Tetrachloride is a non-flammable, toxic, corrosive liquid packaged in cylinders under its own vapor pressure of 4 psia at 70 ° F. The gas is colorless but fumes white in moist air. Hydrolyzes to hydrochloric acid on contact with moisture. Can cause severe chemical burns if inhaled or upon skin contact. When entering release area wear self-contained breathing apparatus (SCBA). Fully protective suits are required in large releases.

### EMERGENCY TELEPHONE NUMBERS

(800) 523-9374 Continental U.S., Canada, and Puerto Rico

(610) 481-7711 other locations

**ACUTE POTENTIAL HEALTH EFFECTS:**

**ROUTES OF EXPOSURE:**

**EYE CONTACT:** Irritation and/or burns to the cornea that may lead to vision impairment or loss.

**INGESTION:** Causes burns to mouth, throat and digestive system.

**INHALATION:** Corrosive and irritating to the respiratory tract and mucous membranes. Coughing, labored breathing and excessive saliva and sputum formation may also occur. Excessive exposure may result in chemical pneumonitis (inflammation), pulmonary hemorrhage (bleeding) and edema (fluid build up) which can be fatal.

**SKIN CONTACT:** Severe irritation or burns. Contact with liquid may cause frostbite.

**POTENTIAL HEALTH EFFECTS OF REPEATED EXPOSURE:**

**ROUTE OF ENTRY:** Inhalation

**TARGET ORGANS:** Respiratory tract, teeth and gums.

**SYMPTOMS:** Chronic exposure to vapors may cause discoloration and erosion of the teeth, ulceration of the nasal passages and respiratory tract, and bleeding gums.

**MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:** Asthma, emphysema or other respiratory diseases.

**CARCINOGENICITY:** This product is not listed as a carcinogen or potential carcinogen by NTP, IARC or OSHA.

## SECTION 4. FIRST AID MEASURES

**Prompt medical attention is required in all cases of exposure to Silicon Tetrachloride. Effects may be delayed.**

**EYE CONTACT:** While holding eyelids open and away from eyeball, flush with water for 15 minutes. This may have to be repeated. Seek medical attention immediately.

**INGESTION:** Drink large quantities of water. Do not induce vomiting. Do not give carbonates. Do not give anything by mouth to an unconscious person. Seek immediate medical attention.

**INHALATION:** Remove person to fresh air. Obtain prompt medical attention. If not breathing, give artificial respiration. Mouth-to-mouth resuscitation is not recommended. If breathing is difficult, give oxygen. Continue with administration of oxygen while waiting for medical attention. If airway obstruction occurs, the placement of an artificial airway by an emergency medical technician may be necessary. Delayed pulmonary edema may occur. Keep patient under medical observation for at least 24 hours.

**SKIN CONTACT:** Flush with water for 15 minutes, while removing all contaminated clothing. Discard all contaminated clothing and shoes. Seek prompt medical attention.

**NOTES TO PHYSICIAN:** Part of the effects from overexposure are due to the liberation of hydrogen chloride. Silicon Tetrachloride is highly irritant and corrosive to mucous membranes. Swallowed it may produce ulceration and possibly perforation in the upper alimentary tract. Mediastinitis or peritonitis and the complications thereof, may develop. Massive overexposure to the vapor may cause delayed onset pulmonary edema. Secondary infection may develop in the inflamed respiratory tract. Patients should be kept under observation. Aspirated material may produce lung injury. Emesis should not be induced mechanically or pharmacologically. If it is considered necessary to evacuate the stomach contents, then this should be undertaken by means least likely to result in aspiration, e.g., in the presence of airway intubation. Caution should be taken to avoid perforation of an acutely inflamed or ulcerated area of the alimentary tract.

#### SECTION 5. FIRE FIGHTING MEASURES

**FLASH POINT: AUTOIGNITION: FLAMMABLE RANGE:** Not applicable Not applicable Not applicable

**EXTINGUISHING MEDIA:** Silicon Tetrachloride is nonflammable and does not support combustion. Use extinguishing media appropriate for surrounding fire.

**SPECIAL FIRE FIGHTING INSTRUCTIONS:** Evacuate all personnel from area. If possible without risk, move cylinders away from fire area. Keep cylinders cool with water spray until well after fire is out.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** Avoid contact of product with water as a vigorous reaction will take place resulting in generation of hydrogen chloride gas.

**HAZARDOUS COMBUSTION PRODUCTS:** Hydrogen chloride, oxides of silicon and chlorine compounds.

#### SECTION 6. ACCIDENTAL RELEASE MEASURES

**STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:** Evacuate all personnel from affected area. Increase ventilation to the release area and monitor silicon tetrachloride levels. Use appropriate protective equipment. Isolate any leaking cylinder. If leak is from cylinder or cylinder valve call the Air Products' emergency telephone number. If the leak is in the user's system, close the cylinder valve, vent the pressure, and purge with an inert gas before attempting repairs.

#### SECTION 7. HANDLING AND STORAGE

**STORAGE:** Store cylinders in a well-ventilated, secure area, protected from the weather. Cylinders should be stored upright with valve outlet seals and valve protection caps in place. Do not allow storage temperature to exceed 125 ° F (52 ° C). Storage should be away from heavily traveled areas and emergency exits. Full and empty cylinders should be segregated. Use a first-in first-out inventory system to prevent full containers from being stored for long periods of time. Local codes may have special requirements for toxic gas storage.

**HANDLING:** Do not drag, roll, slide or drop cylinder. Use a suitable handtruck designed for cylinder movement. Never attempt to lift a cylinder by its cap. Secure cylinders at all times while in use. Use a separate control valve to safely discharge gas from cylinder. Use a check valve to prevent reverse flow into the cylinder. Never apply flame or localized heat directly to any part of the cylinder. Once cylinder has been connected to process, open cylinder valve slowly and carefully. If user experiences any difficulty operating the cylinder valve, discontinue use and contact supplier. Never insert an object (e.g., wrench, screwdriver, etc.) into valve cap openings. Doing so may damage valve causing a leak to occur. Use an adjustable strap-wrench to remove over-tight or rusted caps.

Carbon steel, stainless steel, Monel, or copper are suitable materials of construction for use when no moisture is present. Brass and aluminum should be avoided. Hastelloy, platinum or gold offer good corrosion resistance when moisture is present. Kel-F or Teflon are the preferred gasket materials.

**SPECIAL PRECAUTIONS:** Always store and handle compressed gases in accordance with Compressed Gas Association, Inc. (ph. 703-412-0900) pamphlet CGA P-1, *Safe Handling of Compressed Gases in Containers*. Local regulations may require specific equipment for storage or use.

#### SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**ENGINEERING CONTROLS:**

**VENTILATION:** Provide adequate ventilation and/or local exhaust to prevent accumulation of gas concentrations.

**RESPIRATORY PROTECTION:**

**Emergency Use:** Full face positive pressure airline respirator with escape SCBA or self-contained breathing apparatus should be available for emergencies.

**EYE PROTECTION:** Safety glasses for handling cylinders. Chemical goggles with full faceshield for connecting, disconnecting or opening cylinders.

**SKIN PROTECTION:** Nitrile or neoprene gloves and splash suit when connecting, disconnecting or opening cylinders.

**OTHER PROTECTIVE EQUIPMENT:** Safety shoes, safety shower, eyewash fountain.

#### SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

**APPEARANCE, ODOR AND STATE:** Clear colorless liquid with a sharp acid odor.

**MOLECULAR WEIGHT:** 169.89

**BOILING POINT** (1 atm): 135.68 ° F (57.6 ° C)

**SPECIFIC GRAVITY** (liquid): 1.48 at 68 ° F (20 ° C)

**FREEZING POINT / MELTING POINT:** -91 ° F (-68 ° C)

**VAPOR PRESSURE** (At 70 ° F (21.1 ° C)): 3.89 psia (26.8 kPa, abs)

**GAS DENSITY** (At 70 ° F (21.1 ° C) and 1 atm): 0.1244 lb/ft<sup>3</sup>

**SOLUBILITY IN WATER** (Vol./Vol. at 32° F (0 ° C) and 1 atm): hydrolyzes

#### SECTION 10. STABILITY AND REACTIVITY

**CHEMICAL STABILITY:** Stable

**CONDITIONS TO AVOID:** Contact with moisture. Cylinders should not be exposed to temperatures in excess of 125 ° F (52 ° C).

**INCOMPATIBILITY (Materials to Avoid):** Water, alcohols, phenols, amines, oxidizing materials and strong bases.

**REACTIVITY:**

**A) HAZARDOUS DECOMPOSITION PRODUCTS:** Hydrolysis yields hydrogen chloride.

**B) HAZARDOUS POLYMERIZATION:** Will not occur.

#### SECTION 11. TOXICOLOGICAL INFORMATION

**LC<sub>50</sub> (Inhalation):** 8000 ppm (rat; 4 hour)

**LD<sub>50</sub> (Oral):** No data currently available

**LD<sub>50</sub> (Dermal):** No data currently available

**CARCINOGENICITY:** No data currently available

**SKIN CORROSIVITY:** Silicon Tetrachloride is corrosive to the skin.

**ADDITIONAL NOTES TO PHYSICIAN:** Hydrogen Chloride will be formed whenever Silicon Tetrachloride comes into contact with moisture, including the moisture in the human body. Silicon Tetrachloride has been evaluated in a battery of tests for mutagenicity /genotoxicity and has not caused mutations or chromosomal damage.

#### SECTION 12. ECOLOGICAL INFORMATION

**AQUATIC TOXICITY:** There is no definitive aquatic toxicity available.

**MOBILITY:** Unknown

**PERSISTENCE AND BIODEGRADABILITY:** Unknown

**POTENTIAL TO BIOACCUMULATE:** Unknown

**REMARKS:** Do not release large amounts of silicon tetrachloride to the atmosphere. This product does not contain any Class I or Class II ozone depleting chemicals.

#### SECTION 13. DISPOSAL CONSIDERATIONS

**UNUSED PRODUCT / EMPTY CONTAINER:** Return cylinder and unused product to supplier. Do not attempt to dispose of unused product.

**DISPOSAL INFORMATION:** Destruction by scrubbing with caustic is the most commonly used method.

#### SECTION 14. TRANSPORT INFORMATION

**DOT SHIPPING NAME:** Silicon Tetrachloride

Packing Group II

**HAZARD CLASS:** 8

**IDENTIFICATION NUMBER:** UN1818

**SHIPPING LABEL(s):** Corrosive

**PLACARD (When required):** Corrosive

**SPECIAL SHIPPING INFORMATION:** Cylinders should be transported in a secure position in a well ventilated vehicle. Never transport in passenger compartment of a vehicle. Ensure cylinder valve is properly closed, valve outlet cap has been reinstalled, and valve protection cap is secured before shipping cylinder.

**CAUTION:** Compressed gas cylinders shall not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with the owner's written consent is a violation of federal law (49 CFR 173.301).

**NAERG #:** 156

#### SECTION 15. REGULATORY INFORMATION

**U.S. FEDERAL REGULATIONS:**

**EPA - ENVIRONMENTAL PROTECTION AGENCY**

**CERCLA:** Comprehensive Environmental Response, Compensation, and Liability Act of 1980

(40 CFR Parts 117 and 302)

Reportable Quantity (RQ): None

**SARA TITLE III:** Superfund Amendment and Reauthorization Act

**SECTIONS 302/304:** Emergency Planning and Notification (40 CFR Part 355)

Extremely Hazardous Substances: Silicon Tetrachloride is not listed.

Threshold Planning Quantity (TPQ): None

Reportable Quantity (RQ): None

**SECTIONS 311/312:** Hazardous Chemical Reporting (40 CFR Part 370)

IMMEDIATE HEALTH: Yes PRESSURE: No

DELAYED HEALTH: No REACTIVITY: Yes

FIRE: No

**SECTION 313:** Toxic Chemical Release Reporting (40 CFR Part 372)

Silicon Tetrachloride does not require reporting under Section 313.

**CLEAN AIR ACT:**

**SECTION 112 (r):** Risk Management Programs for Chemical Accidental Release

(40 CFR Part 68)

Silicon Tetrachloride is not listed as a regulated substance.

Threshold Planning Quantity (TPQ): None

**TSCA:** Toxic Substance Control Act

Silicon Tetrachloride is listed on the TSCA inventory.

**OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:**

**29 CFR Part 1910.119:** Process Safety Management of Highly Hazardous Chemicals.

Silicon Tetrachloride is not listed in Appendix A as a highly hazardous chemical. Threshold Planning Quantity (TPQ): None

**STATE REGULATIONS:**

**CALIFORNIA:**

Proposition 65: This product is not a listed substance which the State of California requires warning under this statute.

**SECTION 16. OTHER INFORMATION**

**NFPA RATINGS: HMIS RATINGS:**

HEALTH: = 3 HEALTH: = 3

FLAMMABILITY: = 0 FLAMMABILITY: = 0

REACTIVITY: = 1 REACTIVITY: = 1

SPECIAL: ~~W~~