

Silicon tetrachloride

This document is a high-level summary intended to provide the general public with an overview of product safety for this substance. It is not intended to replace the Material Safety Data Sheet (MSDS), which is available from suppliers and should be referred to for full details of recommended safety procedures for each type of use. It is not intended to replace or supersede manufacturer's instructions and warnings for their consumer products containing this substance.

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An additional document for the safe handling of chlorosilanes can be found at: <http://www.silicones-safety.eu/files/Chlorosilanes%20Manual%2022082003.pdf>

Substance Name and Chemical Identity

Chemical Name:
Silicon tetrachloride

CAS Number:
10026-04-7

Molecular formula:
Cl₄Si

Uses and Applications

Silicon tetrachloride is an inorganic silicon substance that has been used in the following applications:

- Use as an intermediate (starting material) in the production of other silicon-based substances.
- Use as a 'co-reactant' in the production of silicone polymers. Silicone polymers may be oils, greases, rubbers and resins and have a wide range of uses.
- Use in the electronics industry for semiconductor manufacture and production of optical fibers.

The substance is not suitable for use by the general public. The applications described take place in industrial settings and academic laboratories under highly controlled conditions. Although the end uses of products made from silicon tetrachloride will vary, it is expected that due to its highly reactive nature, no residual unreacted material will be present in any of the final products.

Silicon tetrachloride is used in the electronics industry for the production of ultra-pure polysilicon in the manufacture of semiconductors and photovoltaics. It is also the starting material for the production of special glass which is required for optical fibers.

In most instances, use is as an intermediate in the synthesis of other silicon-based materials. Alternatively, as more of a facilitative role such as use as a "blocking agent" in organic synthesis or as a surface modifying agent is common. In any event, these uses are generally of low volume, a few kilograms at most.

Physical/Chemical Properties

Silicon tetrachloride is a highly volatile non-flammable liquid with a low boiling point. It reacts violently with water, rapidly breaking down to silicic acid and hydrochloric acid. The substance is not classified for hazardous physicochemical properties under the EU Globally Harmonized System (GHS). However, in the EU an additional hazard statement applies as follows:

- 'EUH014: Reacts violently with water'

| Property | Value |
|---------------------------|------------------------|
| Physical state | Liquid |
| Color | Colorless |
| Odor | Stinging |
| Molecular weight | 169.9 g/mol |
| Melting/boiling point | 68.9°C/57°C |
| Density | 1.48 g/cm ³ |
| Vapor pressure | 29 000 Pa at 22.5°C |
| Flammability | Non-flammable |
| Flash point | n/a |
| Self-ignition temperature | >650°C |
| Explosive properties | Not explosive |

Health Information

Silicon tetrachloride is classified for human health hazards under the EU Globally Harmonized System (GHS) as:

- Skin Corrosive. 1A;
'R35 Causes severe burns'
- Acute toxic 3 (oral);
'H301: Toxic if swallowed'
- Acute toxic 3 (vapor);
'H331: Toxic if inhaled'

In the EU an additional hazard statement also applies:

- 'EUH071 Corrosive to the respiratory tract'

Environmental Information

Silicon tetrachloride is not classified for environmental effects under the EU Globally Harmonized System (GHS).

Exposure Potential

Consumer exposure: There are no consumer uses of silicon tetrachloride. It is expected that there is no residual silicon tetrachloride in end-products manufactured using the substance.

Workplace exposure: This refers to potential for worker exposure at manufacturing sites or industrial workplaces. Due to the reactive nature of the substance, all aspects of silicon tetrachloride handling, including on-site storage and transfer, require highly controlled conditions. Further details are given in the Safety Data Sheet and CES Guidance Document on safe handling.

Environmental releases:

Manufacturing occurs under controlled conditions and is typically subject to stringent regulations, with only very small releases to air and wastewater. Environmental exposure can be minimized by applying air and wastewater abatement technologies to remove unreacted substance and reaction products. The use of appropriate measures to manage environmental release is described in the Safety Data Sheet and CES Guidance Document on safe handling.

Risk Management Recommendations

Consumer risk management: There are no consumer uses of this substance.

Industrial risk management: For more detailed information please refer to the Safety Data Sheet and the chlorosilanes safe handling document for information on protecting workers and limiting environmental exposure at industrial sites. In summary, when using this chemical, there must be adequate ventilation. Suitable respiratory protection must be worn if the product is handled in large quantities in confined spaces. Chemical-resistant clothing and gloves, and safety glasses or other suitable eye protection must be worn. Keep containers tightly closed, in a dry and cool place. In a laboratory setting, local exhaust ventilation must be in place and personal protective equipment must be worn with adherence to good laboratory practice.

Conclusions

Silicon tetrachloride is used only under highly controlled conditions at industrial sites and in the laboratory. The manufacturing and use of silicon tetrachloride does not pose a significant risk to humans or the environment if instructions in the Safety Data Sheet and applicable legal requirements are followed.

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Reach our Global Customer Service network at:

U.S. and Canada **+1 888 443 9466**
E-mail: 4information@momentive.com

Europe **+800 836 43581**
E-mail: 4information.eu@momentive.com

All Others **+86 21 3860 4638**

Please refer to the literature code MOM-122 when contacting us.



World Headquarters

180 East Broad Street
Columbus, OH 43215-3799

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