

Safety data sheet Trichlorosilane

Creation date : 18.01.2012
Revision date : 09.02.2012

Version : 1.2

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SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name

Trichlorosilane
EC No (from EINECS): 233-042-5
CAS No: 10025-78-2
Index-Nr.

Chemical formula Cl₃HSi

REACH Registration number:

01-2119494046-35

1.2. Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses

Industrial and professional. Perform risk assessment prior to use.

Uses advised against

Consumer use.

1.3. Details of the supplier of the safety data sheet

Company identification

BOC, Priestley Road, Worsley, Manchester M28 2UT

E-Mail Address ReachSDS@boc.com

1.4. Emergency telephone number

Emergency phone numbers (24h): 0800 111 333

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification acc. to Regulation (EC) No 1272/2008/EC (CLP/GHS)

Flammable liquid: Flam. Liq. 1 – Extremely flammable liquid and vapour

Pyr. Liquid 1 - Catches fire spontaneously if exposed to air.

Acute Tox. 4 - Harmful if swallowed.

Skin Corr. 1A - Causes severe skin burns and eye damage.

Acute Tox. 3 - Toxic if inhaled.

Classification acc. to Directive 67/548/EEC & 1999/45/EC:

F+; R12 | R14 | F; R17 | Xn; R20/22 | R29 | C; R35

Extremely flammable.

Reacts violently with water.

Highly flammable; Spontaneously flammable in air.

Harmful; Harmful by inhalation and if swallowed.

Contact with water liberates toxic gas.

Corrosive; Causes severe burns

Risk advice to man and the environment

Contact with liquid may cause cold burns/frost bite

2.2. Label elements

- Labelling Pictograms



- Signal word

Danger

- Hazard Statements

H224 Extremely flammable liquid and vapour.
H250 Catches fire spontaneously if exposed to air.

H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H331	Toxic if inhaled.
EUH014	Reacts violently with water.
EUH029	Contact with water liberates toxic gas.
EUH071	Corrosive to the respiratory tract.

- Precautionary Statements

Precautionary Statement Prevention

P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

Precautionary Statement Response

P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
P304 + P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351+ P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Precautionary Statement Storage

P403 + P235 Store in a well-ventilated place. Keep cool.

Precautionary Statement Disposal

P501 Dispose of contents and container in accordance with local regulations.

2.3. Other hazards

Contact with liquid may cause cold burns/frost bite.

SECTION 3: Composition/information on ingredients

Substance / Mixture: Substance.

3.1. Substances

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Contains no other components or impurities which will influence the classification of the product.

3.2. Mixtures

Not applicable.

SECTION 4: First aid measures

4.1. Description of first aid measures

First Aid General Information:

Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

First Aid Inhalation:

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Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

First Aid Skin / Eye:

For liquid spillage - flush with water for at least 15 minutes. Remove contaminated clothing. Drench affected area with water for at least 15 minutes. Immediately flush eyes thoroughly with water for at least 15 minutes. Obtain medical assistance.

First Aid Ingestion:

If victim is conscious: Rinse mouth out with plenty of water. Let victim drink water as much as possible in small sips. Do NOT induce vomiting. Get immediate medical advice/attention.

4.2. Most important symptoms and effects, both acute and delayed

Causes severe skin burns and eye damage. . Possible symptoms are irritation of the mucous membranes, dry cough and respiratory difficulty. Symptoms may include dizziness, headache, nausea and loss of co-ordination Suitable first-aid treatment should be immediately available. Seek medical advice before using product. May result in pulmonary oedema.

4.3. Indication of any immediate medical attention and special treatment needed

Obtain medical assistance.
Recommendations to physicians: Provide oxygen.

SECTION 5: Fire fighting measures

5.1. Extinguishing media

Suitable extinguishing media

Dry sand. Carbon dioxide. Alcohol-resistant foam... Use water spray or fog to control fire fumes.

Unsuitable extinguishing media

Do not use a solid water stream.

5.2. Special hazards arising from the substance or mixture

Specific hazards

Exposure to fire may cause containers to rupture/explode.

Hazardous combustion products

If involved in a fire the following toxic and/or corrosive fumes may be produced by thermal decomposition: Silica dust (inert - but may irritate respiratory tract and eyes)

Hydrogen chloride, Chlorine.

5.3. Advice for fire-fighters

Specific methods

If possible, stop flow of product. If leaking do not extinguish a flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur. Extinguish any other fire. Move container away or cool with water from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems.

Special protective equipment for fire-fighters

Gas tight chemically protective clothing (Type 1) in combination with self contained breathing apparatus.

Guideline:

EN 943-2:2002: Protective clothing against liquid and gaseous chemicals, aerosols and solid particles. Performance requirements for gas-tight (Type 1) chemical protective suits for emergency teams (ET).

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Evacuate area. Use self-contained breathing apparatus and chemically protective clothing. Ensure adequate air ventilation. Eliminate ignition sources. Consider the risk of potentially explosive atmospheres. Monitor concentration of released product. Prevent

from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.

6.2. Environmental precautions

Try to stop release. Reduce vapour with fog or fine water spray.

6.3. Methods and material for containment and cleaning up

Ventilate area. Keep away from ignition sources (including static discharges). Evacuate area. Prevent evaporation by covering with foam. Absorb excess liquid spillage on inorganic adsorbent material such as fine sand, brick dust etc. Place spent adsorbent in sealed packages and contact specialist waste disposal contractor.

6.4. Reference to other sections

See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Only experienced and properly instructed persons should this product. The substance must be handled in accordance with good industrial hygiene and safety procedures. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your supplier if in doubt. Avoid exposure, obtain special instructions before use. Take precautionary measures against static discharges. Ensure equipment is adequately earthed. Purge air from system before introducing product. Keep away from ignition sources (including static discharges). Do not smoke while handling product. Assess the risk of a potentially explosive atmosphere and the need for explosion-proof equipment. Consider the use of only non-sparking tools. Ensure the complete system has been (or is regularly) checked for leaks before use. Installation of a cross purge assembly between the container and the regulator is recommended. Purge system with dry inert gas (e.g. helium or nitrogen) before product is introduced and when system is placed out of service. Avoid suckback of water, acid and alkalis. Refer to supplier's handling instructions. Do not allow backfeed into the container. Protect containers from physical damage; do not drag, roll, slide or drop. When moving containers, even for short distances, use appropriate equipment e.g. trolley, hand truck, fork truck etc. Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use. If user experiences any difficulty operating container valve discontinue use and contact supplier. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Keep container valve outlets clean and free from contaminants particularly oil and water. Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to transfer product from one container to another. Never use direct flame or electrical heating devices to raise the pressure of a container. Do not remove or deface labels provided by the supplier for the identification of the container contents.

7.2. Conditions for safe storage, including any incompatibilities

Segregate from oxidant gases and other oxidants in store. Keep container below 50°C in a well ventilated place. Secure cylinders to prevent them from falling. Observe all regulations and local requirements regarding storage of containers. Cylinders should be stored in the vertical position and properly secured to prevent falling over. Stored containers should be periodically checked for general conditions and leakage. Container valve guards or caps should be in place. Store containers in location free from fire risk and away from sources of heat and ignition. Keep away from combustible materials. All electrical equipment in the storage areas should be compatible

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with the risk of potentially explosive atmosphere. Containers should not be stored in conditions likely to encourage corrosion.

7.3. Specific end use(s)
None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Exposure limit value

Value type	Value	Note
Great Britain - STEL	5 ppm	EH 40/07
Great Britain - LTEL	1 ppm	EH 40/07

OELs for Trichlorosilane have not been established. The exposure limits of Hydrogen chloride have been used on this SDS as Hydrogen chloride is a hydrolysis product of Trichlorosilane.

Derived No Effect Levels

Type	Exposure	Value	Population	Effects
DNEL	Long term Dermal	0,69 mg/kg bw/day	Workers	Systemic
DNEL	Long term Inhalation	47 mg/m ³	Workers	Systemic
DNEL	Long term Inhalation	9,9 mg/m ³	Workers	Local

Predicted No Effect Concentrations

Type	Compartment Detail	Value
PNEC	STP (Sewage Treatment Plant)	3.2 mg/L

8.2. Exposure controls

Appropriate engineering controls

A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk. The following recommendations should be considered. Gas detectors should be used when toxic quantities may be released. Gas detectors should be used when quantities of flammable gases/vapours may be released. Consider work permit system e.g. for maintenance activities. Systems under pressure should be regularly checked for leakages. Provide adequate general or local ventilation. Handle under inert gas.

Personal protective equipment

Eye and face protection

Protect eyes, face and skin from contact with product. Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Wear a face-shield when transfilling and breaking transfer connections. Safety eyewear, goggles or face-shield to EN166 should be used to avoid exposure to liquid splashes. Wear eye protection to EN 166 when using gases. Full-face mask recommended

Guideline:

EN 136 Respiratory protective devices. Full face masks. Requirements, testing, marking

Skin protection

Hand protection

Advice: Wear working gloves and safety shoes while handling containers., Chemically resistant gloves complying with EN 374 should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Material: Viton

Min. Breakthrough time: 480 min

Glove thickness: 0,7 mm

Material: Butyl rubber (Butyl)
Min. Breakthrough time: 60 min
Glove thickness: 0,7 mm

Guideline: EN 388 Protective gloves. EN 374-1/2/3 Protective gloves against chemicals and micro-organisms.

Body protection

Protect eyes, face and skin from contact with product. Keep suitable chemically resistant protective clothing readily available for emergency use. Personal protective equipment for the body should be selected based on the task being performed and the risks involved.

Guideline:

EN 943: Protective clothing against liquid and gaseous chemicals, including liquid aerosols and solid particles.

Other protection

Wear flame resistant/retardant clothing. Take precautionary measures against static discharges. Wear working gloves and safety shoes while handling containers. EN ISO 20345 Personal protective equipment - Safety footwear. ISO/TR 2801:2007 Clothing for protection against heat and flame -- General recommendations for selection, care and use of protective clothing.

Respiratory protection

Keep self contained breathing apparatus readily available for emergency use., Use SCBA in the event of high concentrations. The selection of the Respiratory Protective Device (RPD) must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected RPD., When allowed by a risk assessment a supplied air respirator may be used.

Guideline:

EN 136 Respiratory protective devices. Full face masks. Requirements, testing, marking

Guideline:

EN 137 Respiratory protective devices — Self-contained open-circuit compressed air breathing apparatus with full face mask — Requirements, testing, marking.

Thermal hazards

Not applicable

Environmental Exposure Controls

Specific risk management measures are not required beyond good industrial hygiene and safety procedures. Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

General information

Appearance/Colour: Colourless liquid,

Odour: Pungent

Odour threshold:

Odour threshold is subjective and inadequate to warn for over exposure.

Melting point: -128,2 °C

Boiling point: 31,8 °C

Flash point: -28 °C

Evaporation rate: Not available.

Flammability range: 1,2 %(V) – 90,5 %(V)

Vapour Pressure 20 °C: 0,69 bar

Relative density, gas (Air=1): 4,7

Solubility in water: Hydrolyses.

Partition coefficient: n-octanol/water:

Not applicable.

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Autoignition temperature: 104 °C
Molecular weight: 135,5 g/mol
Critical temperature: 206 °C
Relative density, liquid (Water=1): 1,34

9.2. Other information

Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

SECTION 10: Stability and reactivity

10.1. Reactivity

No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Can form potentially explosive atmosphere in air. May react violently with oxidants.

10.4. Conditions to avoid

Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

10.5. Incompatible materials

Air, Oxidiser. Reacts with water and moisture to form gelatinous silicic acid and other corrosive acid(s). With water causes rapid corrosion of some metals. Reacts with water liberating hydrogen, an extremely flammable gas.

For material compatibility see latest version of ISO-11114.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced. If involved in a fire the following toxic and/or corrosive fumes may be produced by thermal decomposition: Silica dust (inert - but may irritate respiratory tract and eyes)

Hydrogen chloride.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute inhalation toxicity

Value: LC50

Species: Rat

Exposure time: 1 h

Value in non-standard unit: 7,5 mg/l

Delayed fatal pulmonary oedema possible.

Method: OECD Test Guideline 403

Acute oral toxicity

Value: LD50

Species: Rat

Method: OECD Test Guideline 401

Value in non-standard unit: 1030 mg/kg

Skin irritation

Severe corrosion to the skin at high concentrations.

Eye irritation

Severe corrosion to the eyes at high concentrations.

Sensitization

No data available.

Repeated dose toxicity

Species: Rat

Route of application: Oral

Exposure time: 28d

Value type: NOAEL

Value: 50 mg/kg

Method: OECD Test Guideline 422

Test substance: Read across

Species: Rat

Route of application: Inhalation

Exposure time: 90d

Value type: NOAEL

Value: 0,56 mg/l

Method: OECD Test Guideline 413

Test substance: Read across

Genetic toxicity in vitro

Negative

Genetic toxicity in vivo

Negative

Assessment carcinogenicity

No known effects from this product.

Toxicity to reproduction/fertility

Species: Rat

Route of application: Oral, gavage

Value type: NOAEL

Value: 1000 mg/kg bw/day

Method: OECD Test Guideline 422

Test substance: Read across

Assessment toxicity to reproduction

No known effects from this product.

Developmental toxicity/teratogenicity

Species: Rat

Route of application: Oral, gavage

Value type: NOAEL

Value: 1000 mg/kg/day

Method: OECD Test Guideline 422

Test substance: Read across

Assessment teratogenicity

No known effects from this product.

Specific Target Organ Toxicity (STOT) - Single Exposure

No known effects from this product.

Specific Target Organ Toxicity (STOT) - Repeated Exposure

No known effects from this product.

Aspiration hazard

Aspirated material may produce lung injury

SECTION 12: Ecological information

12.1. Toxicity

Acute and prolonged toxicity fish

Species: Rainbow trout (*Oncorhynchus mykiss*)

Exposure time: 96

Method: OECD Test Guideline 422

Value type: LC50

Value in standard unit mg/l: >100

Acute toxicity aquatic invertebrates

Species: Water flea (*Daphnia magna*)

Exposure time: 48h

Method: OECD Test Guideline 202

Value type: EC50

Value in standard unit mg/l: >844

Toxicity aquatic plants

Species: Algae

Exposure time: 72h

Method: OECD Test Guideline 201

Value type: EC50

Value in standard unit mg/l: >100

Species: Algae

Exposure time: 72h

Method: OECD Test Guideline 201

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Value type: NOEC
Value in standard unit mg/l: <6,3 mg/l

12.2. Persistence and degradability

The substance hydrolyses rapidly to silanetriol and Hydrogen chloride. These are inorganic substances which enter natural biogeochemical cycles; degradation studies are not relevant.

12.3. Bioaccumulative potential

A bioaccumulation in aquatic species study does not need to be conducted as direct or indirect exposure of aquatic organisms to the registered substance is very limited due to the instability of the substance in water.

12.4. Mobility in soil

Low mobility.

12.5. Results of PBT and vPvB assessment

Not classified as PBT or vPvB.

12.6. Other adverse effects

May cause pH changes in aqueous ecological systems.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Must not be discharged to atmosphere. Do not discharge into any place where its accumulation could be dangerous. Contact supplier if guidance is required. Gas may be scrubbed in alkaline solution under controlled conditions to avoid violent reaction. Toxic and corrosive gases formed during combustion should be scrubbed before discharge to atmosphere. Do not discharge into areas where there is a risk of forming an explosive mixture with air. Waste gas should be flared through a suitable burner with flash back arrestor. Gases formed by combustion should be washed with water to remove silica. Refer to the EIGA code of practice (Doc.30 "Disposal of Gases", downloadable at <http://www.eiga.org>) for more guidance on suitable disposal methods.

SECTION 14: Transport information

ADR/RID

14.1. UN number
1295

14.2. UN proper shipping name
Trichlorosilane

14.3. Transport hazard class(es)
Class: 4.3
Classification Code: WFC
Labels: 4.3, +3, +8
Hazard number: x338
Tunnel restriction code: (B/E)
Emergency Action Code: 4WE

14.4. Packing group (Packing Instruction)
I

14.5. Environmental hazards
None.

14.6. Special precautions for user
None.

IMDG

14.1. UN number
1295

14.2. UN proper shipping name
Trichlorosilane

14.3. Transport hazard class(es)
Class: 4.3
Labels: 4.3, +3, +8
EmS: F-G, S-O

14.4. Packing group (Packing Instruction)
I

14.5. Environmental hazards
None.

14.6. Special precautions for user
None.

14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code
Not applicable.

IATA

14.1. UN number
1295

14.2. UN proper shipping name
Trichlorosilane

14.3. Transport hazard class(es)
Class: 4.3

14.4. Packing group (Packing Instruction)
Passenger Aircraft: Not permitted for transport
Cargo Aircraft: Not permitted for transport

14.5. Environmental hazards
None.

14.6. Special precautions for user
None.

Other transport information

Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers ensure that they are firmly secured. Ensure that the container valve is closed and not leaking. Ensure that the valve outlet cap nut or plug (where provided) is correctly fitted. Ensure that the valve protection device (where provided) is correctly fitted. Ensure adequate ventilation. Ensure compliance with applicable regulations.

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture
Seveso Directive 96/82/EC: Covered

Other regulations

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Dangerous Substances and Explosive Atmospheres Regulations (DSEAR 2002 No. 2776)
Management of Health and Safety at Work Regulations (1999 No. 3242)
The Regulatory Reform (Fire Safety) Order 2005 (2005 No. 1541)
Control of Substances Hazardous to Health Regulations (COSHH, 2002 No. 2677)
Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations (EPS, 1996 No. 192)
Provision and Use of Work Equipment Regulations (PUWER, 1998 No. 2306)
Personal Protective Equipment Regulations (1992 No. 2966)
Control of Major Accident Hazards Regulations (COMAH, 1999 No. 743)
Chemical Hazards Information and Packaging for Supply (CHIP, 1994 No. 3247)
Pressure Systems Safety Regulations (PER, 2000 No. 128)
This Safety Data Sheet has been produced to comply with Regulation (EU) 453/2010.

15.2. Chemical safety assessment

CSA has not been carried out.

SECTION 16: Other information

Ensure operators understand the flammability hazard. Ensure operators understand the toxicity hazard. Users of breathing apparatus must be trained. Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.

Advice

Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted. Details given in this document are believed to be correct at the time of going to press.

Further information

Note:

When using this document care should be taken, as the decimal sign and its position complies with rules for the structure and drafting of international standards, and is a comma on the line. As an example 2,000 is two (to three decimal places) and not two thousand, whilst 1.000 is one thousand and not one (to three decimal places).

References

Various sources of data have been used in the compilation of this SDS; they include but are not exclusive to:

European Chemical Agency: Guidance on the Compilation of Safety Data Sheets.

European Chemical Agency: Information on Registered Substances <http://apps.echa.europa.eu/registered/registered-sub.aspx#search>

European Industrial Gases Association (EIGA) Doc. 169/11 Classification and Labelling guide.

ISO 10156:2010 Gases and gas mixtures -- Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets.

International Programme on Chemical Safety (<http://www.inchem.org/>)

Matheson Gas Data Book, 7th Edition.

National Institute for Standards and Technology (NIST) Standard Reference Database Number 69

The ESIS (European chemical Substances 5 Information System) platform of the former European Chemicals Bureau (ECB) ESIS (<http://ecb.jrc.ec.europa.eu/esis/>).

The European Chemical Industry Council (CEFIC) ERICards.

United States of America's National Library of Medicine's toxicology data network TOXNET (<http://toxnet.nlm.nih.gov/index.html>)

Agency for Toxic Substances and Diseases Registry (ATSDR) (<http://www.atsdr.cdc.gov/>)

Threshold Limit Values (TLV) from the American Conference of Governmental Industrial Hygienists (ACGIH).
Substance specific information from suppliers.
EH40 (as amended) Workplace exposure limits.

End of document