

MONOCHLOROSILANE

1. Product and company identification

Product name	: MONOCHLOROSILANE
Synonym	: MCS
Material uses	: Not available.
CAS number	: 13465-78-6
Manufacturer	: REC Silicon Inc. 119140 Rick Jones Way Silver Bow, Montana 59750 United State of America 406-496-9877 Email: RECSiliconMSDS@recgroup.com 3322 Road N Northeast Moses Lake, Washington 98837 United State of America 509-766-9299
Validation date	: 05/24/2011.
Prepared by	: Atrion Regulatory Services, Inc.
<u>In case of emergency</u>	: CHEMTREC, U.S. : 1-800-424-9300 International: +1-703-527-3887

2. Hazards identification

Physical state	: Gas. [Liquefied gas]
Color	: Colorless.
Odor	: hydrochloric acid
<u>Emergency overview</u>	
Signal word	: DANGER!
Hazard statements	: FLAMMABLE GAS. MAY CAUSE FLASH FIRE. CAUSES RESPIRATORY TRACT, EYE AND SKIN BURNS. HARMFUL IF INHALED. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
Precautions	: Keep away from heat, sparks and flame. Do not breathe gas. Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.
OSHA/HCS status	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Routes of entry	: Dermal contact. Eye contact. Inhalation.
<u>Potential acute health effects</u>	
Inhalation	: Toxic by inhalation. Corrosive to the respiratory system.
Ingestion	: May cause burns to mouth, throat and stomach. Ingestion of liquid can cause burns similar to frostbite.
Skin	: Corrosive to the skin. Causes burns. Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.
Eyes	: Corrosive to eyes. Causes burns. Liquid can cause burns similar to frostbite.
<u>Potential chronic health effects</u>	
Chronic effects	: May cause target organ damage, based on animal data.
Carcinogenicity	: No known significant effects or critical hazards.
Mutagenicity	: No known significant effects or critical hazards.

2. Hazards identification

- Teratogenicity** : No known significant effects or critical hazards.
- Developmental effects** : No known significant effects or critical hazards.
- Fertility effects** : No known significant effects or critical hazards.
- Target organs** : May cause damage to the following organs: upper respiratory tract, skin, eyes.

Over-exposure signs/symptoms

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Ingestion : Adverse symptoms may include the following:
frostbite
stomach pains

Skin : Adverse symptoms may include the following:
frostbite
pain or irritation
redness
blistering may occur

Eyes : Adverse symptoms may include the following:
frostbite
pain
watering
redness

Medical conditions aggravated by over-exposure : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

3. Composition/information on ingredients

Name	CAS number	%
chlorosilane	13465-78-6	60-100

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4. First aid measures

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : In case of contact with liquid, warm frozen tissues slowly with lukewarm water. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : As this product rapidly becomes a gas when released, refer to the inhalation section.

4. First aid measures

- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.
- Notes to physician** : No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5. Fire-fighting measures

- Flammability of the product** : Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Gas may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back, causing fire or explosion.
- Extinguishing media**
- Suitable** : Use an extinguishing agent suitable for the surrounding fire.
- Not suitable** : Do not use water jet.
- Special exposure hazards** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance.
- Hazardous thermal decomposition products** : Decomposition products may include the following materials:
halogenated compounds
metal oxide/oxides
hydrogen chloride
hydrogen
silicon (Oxide.)
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. For incidents involving large quantities, thermally insulated undergarments and thick textile or leather gloves should be worn.

6. Accidental release measures

- Personal precautions** : Accidental releases pose a serious fire or explosion hazard. Immediately contact emergency personnel. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).
- Environmental precautions** : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
- Methods for cleaning up**
- Small spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

6. Accidental release measures

- Large spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7. Handling and storage

- Handling** : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Contains gas under pressure. Do not get in eyes or on skin or clothing. Do not breathe gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Keep away from water or moist air. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container.
- Storage** : Store in accordance with local regulations. Store in a segregated and approved area. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Keep away from water or moist air. Keep container tightly closed and sealed until ready for use.

8. Exposure controls/personal protection

United States

No exposure limit value known.

Consult local authorities for acceptable exposure limits.

- Recommended monitoring procedures** : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

- Engineering measures** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

- Hygiene measures** : 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. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. If contact with the liquid is possible, insulated gloves suitable for low temperatures should be worn. >8 hours (breakthrough time): Leather.

8. Exposure controls/personal protection

- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts. Recommended: full-face mask
- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9. Physical and chemical properties

- Physical state** : Gas. [Liquefied gas]
- Flash point** : Closed cup: -90°C (-130°F) [Tagliabue.]
- Flammable limits** : Lower: 4.6 to 4.8%
Upper: 94 to 98%
- Color** : Colorless.
- Odor** : hydrochloric acid
- Molecular weight** : 66.56 g/mole
- Molecular formula** : ClH₃Si
- Boiling/condensation point** : -30.417°C (-22.8°F)
- Melting/freezing point** : -118°C (-180.4°F)
- Vapor pressure** : 16.7 kPa (125.3 mm Hg) [50°C]
- Vapor density** : 2.3 [Air = 1]
- Evaporation rate** : 82 (butyl acetate = 1)
- Viscosity** : Not available.
- Solubility** : Reacts violently with water.
- Physical/chemical properties comments** : Volatility (W/W (%)): 100%

10. Stability and reactivity

- Chemical stability** : The product is stable.
- Conditions to avoid** : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow gas to accumulate in low or confined areas.
- Incompatible materials** : Reactive or incompatible with the following materials: oxidizing materials. Ammonia, water, air, alcohols, amines
- Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
- Possibility of hazardous reactions** : Under normal conditions of storage and use, hazardous reactions will not occur.
- Under normal conditions of storage and use, hazardous polymerization will not occur.

11. Toxicological information

Acute toxicity

Not available.

Chronic toxicity

Not available.

Irritation/Corrosion

Not available.

Sensitizer

Not available.

Carcinogenicity

Classification

Not available.

Mutagenicity

Not available.

Teratogenicity

Not available.

Reproductive toxicity

Not available.

12. Ecological information

Ecotoxicity : No known significant effects or critical hazards.

Aquatic ecotoxicity

Not available.

Persistence/degradability

Not available.










13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Empty pressure vessels should be returned to the supplier. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14. Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	UN3309	Liquefied gas, toxic, flammable, corrosive, n.o.s. (chlorosilane)	2.3 (2.1, 8)	-	  	Limited quantity Yes. Packaging instruction Passenger aircraft Quantity limitation: Forbidden. Cargo aircraft Quantity limitation: Forbidden. Special provisions 1
IMDG Class	UN3309	LIQUEFIED GAS, TOXIC, FLAMMABLE, CORROSIVE, N.O.S. (chlorosilane)	2.3 (2.1, 8)	-	  	Emergency schedules (EmS) _F-D_, S-U
IATA-DGR Class	UN3309	Liquefied gas, toxic, flammable, corrosive, n.o.s. (chlorosilane)	2.3 (2.1, 8)	-	  	Passenger and Cargo Aircraft Quantity limitation: Forbidden Packaging instructions: Forbidden Cargo Aircraft Only Quantity limitation: Forbidden Packaging instructions: Forbidden Limited Quantities - Passenger Aircraft Quantity limitation: Forbidden Packaging instructions: Forbidden

PG* : Packing group

15. Regulatory information

HCS Classification : Flammable gas
 Compressed gas
 Water-reactive material
 Toxic material
 Corrosive material
 Target organ effects

U.S. Federal regulations : **TSCA 8(a) IUR**: Partial exemption
United States inventory (TSCA 8b): This material is listed or exempted.

15. Regulatory information

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: No products were found.
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: No products were found.
Clean Air Act (CAA) 112 accidental release prevention: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 313

Form R - Reporting requirements : Not applicable.

Supplier notification : Not applicable.

State regulations

Massachusetts : This material is not listed.

New York : This material is not listed.

New Jersey : This material is not listed.

Pennsylvania : This material is not listed.

Not available.

United States inventory (TSCA 8b) : This material is listed or exempted.

Canada inventory : This material is not listed in DSL but is listed in NDSL.

International regulations

International lists : **Australia inventory (AICS):** Not determined.
China inventory (IECSC): Not determined.
Japan inventory: This material is listed or exempted.
Korea inventory: This material is listed or exempted.
New Zealand Inventory of Chemicals (NZIoC): Not determined.
Philippines inventory (PICCS): Not determined.

Chemical Weapons Convention List Schedule I Chemicals : Not listed

Chemical Weapons Convention List Schedule II Chemicals : Not listed

15. Regulatory information

Chemical Weapons Convention List Schedule III Chemicals : Not listed

16. Other information

Label requirements : FLAMMABLE GAS. MAY CAUSE FLASH FIRE. CAUSES RESPIRATORY TRACT, EYE AND SKIN BURNS. HARMFUL IF INHALED. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

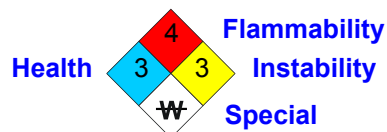
Hazardous Material Information System (U.S.A.) :

Health	*	3
Flammability		4
Physical hazards		3

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :



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Date of issue : 05/24/2011.

Date of previous issue : No previous validation.

Version : 1

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.