Material Safety Data Sheet

Material Name: SILANE MSDS ID: Hynote-0023

Section 1 - Product and Company Identification

Synonyms: Silicon Tetrahydride, Monosilane, Silicane, Silicon Hydride (SiH4)
Chemical Name: Silicon Tetrahydride
Formula: SiH_4
TDG (Canada) CLASSIFICATION: 2.1
WHMIS CLASSIFICATION: A, D2B, B6

ShangHai Hynote

906#,Tower A, Tomson Center,
228 ZhangYang Road, PuDong,
ShangHai, PRC.

EMERGENCY Telephone Numbers:

+86-21-58790001 (In South China):
+86-379-65867058 (In North China)
+86-10-110/119/120 (24 Hours)

Product Information: +86-379-65867058
MSDS Information Email: hynote@shtel.net.cn

Section 2 - Composition/information on ingredients

COMPOSITION: 100%
CAS NUMBER: 7803-62-5
RTECS#: VV1400000
Formula: SiH_4

PEL-OSHA[1]: None Available
TLV-ACGIH[2]: 5 ppm TWA
LD_{50} or LC_{50} Route/Species: LC_{50} 9600 ppm/4H (rat)

[1] As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993).
[2] As stated in the ACGIH 1994-95 Threshold Limit Values for Chemical Substances and Physical Agents.

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Irritating to the eyes, skin and mucous membranes. Hydrolysis of silane inside of body tissues may produce silicic acid. Highly flammable. This product may spontaneously combust in air.

ROUTE OF ENTRY:

Skin Contact	Skin Absorption	Eye Contact	Inhalation	Ingestion
Yes	No	Yes	Yes	No

HEALTH EFFECTS:

Exposure Limits Yes	Irritant Yes	Sensitization No
Teratogen No	Reproductive Hazard No	Mutagen No
Synergistic Effects None Reported		

Carcinogenicity:
NTP: No IARC: No OSHA: No

EYE EFFECTS:
Contact may form silicic acid with resultant irritation.
SKIN EFFECTS:
Skin burns from ignited silane are similar to other thermal burns. Contact may cause irritation.
INGESTION EFFECTS:
Since product is a gas at room temperature, ingestion is unlikely. Consult a physician for treatment. Contact may form silicic acid causing irritation.
INHALATION EFFECTS:
Symptoms of inhalation are not well defined. It has been reported that breathing this gas may cause headache or nausea. The hydrolysis of silane in the body tissues would form silicic acid or hydrated silica.

NFPA HAZARD CODES	HMIS HAZARD CODES	RATINGS SYSTEM
Health: 1	Health: 1	0 = No Hazard
Flammability: 4	Flammability:4	1 = Slight Hazard
Reactivity: 3	Reactivity: 3	2 = Moderate Hazard
		3 = Serious Hazard
		4 = Severe Hazard

Section 4- First Aid Measures

EYES:
Flush eyes with water or sterile saline for at least 15 minutes. See physician for follow up.
SKIN:
Dermal burns from ignited silane should be treated as with any thermal burn. Wash affected area with water. If irritation persists see physician. Normal contact or frostbite:
INGESTION:
DO NOT INDUCE VOMITING! CALL POISON CONTROL CENTER FOR ADVICE.
INHALATION:
PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING

APPARATUS AND BE AWARE OF EXTREME FIRE AND EXPLOSION HAZARD.

Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given artificial resuscitation and supplemental oxygen. Medical assistance should be sought immediately. Treatment should be symptomatic and supportive.

Section 5- Fire-Fighting Measures

Conditions of Flammability: Nonflammable		
Flash point: Pyrophoric	Method: Not Applicable	Autoignition Temperature: None
LEL(%): None	UEL(%): None	
Hazardous combustion products: Silicon compounds		
Sensitivity to mechanical shock: None		
Sensitivity to static discharge: None		

FIRE AND EXPLOSION HAZARDS:
Spontaneously combustible (pyrophoric). Although silane is pyrophoric, low concentrations (in mixtures) may be released without burning. Releases of higher concentrations may result in the potential for a subsequent fire or explosion hazard.
When silane is mixed with gases, such as argon, nitrogen or helium, it is not flammable if its concentration is less than 1 molar percent. However, it is flammable if its concentration is greater than 3 molar percent.
EXTINGUISHING MEDIA:
Use water spray to cool surrounding containers. Inerting the atmosphere to reduce oxygen levels may extinguish flame, allowing capping of leaking container. Do not attempt this unless specifically trained.
FIRE FIGHTING INSTRUCTIONS:
Shut off source of product if safe to do so. Fire fighters should use self-contained breathing apparatus and full turnout gear. Use water spray to cool fire fighters.

Section 6- Accidental Release Measures

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with inert gas prior to attempting repairs. If leak is in container or container valve, contact the appropriate emergency telephone number listed in Section 1 or you're your closest Hynote location.

Section 7- Handling and Storage

Earth ground and bond all lines and equipment associated with the system. Electrical equipment should be nonsparking or explosion-proof.
Pure silane is noncorrosive and may be handled in most common structural containers. Carbon steel, stainless steel, copper, brass, Monel ® & Hasteloy C are the most commonly used materials.

It is also compatible with ordinary glass, Pyrex ®, and quartz. For gasket materials, Viton ®, Nylon, Teflon ®, and Kel-F ® are all satisfactory. Most all silane leaks will ignite in air producing silicon dioxide. Occasionally the silicon dioxide will slow or stop the leak. These leaks are recognizable by the presence of the silicon dioxide and permanent repairs to the leak should be made.

For additional storage recommendations, consult Compressed Gas Association Pamphlets P-1, P-14, and Safety Bulletin SB-2.

Use only in well-ventilated areas. Stationary customer site vessels should be operated in accordance with the manufacturer's and Hynote instructions. Do not attempt to repair, adjust or in any other way modify the operation of these vessels. If there is a malfunction or other type of operations problem with the vessel, contact the closest HYNOTE location immediately for assistance.

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. DO NOT allow the temperature where cylinders are stored to exceed 125°F (52°C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in- first out" inventory system to prevent full cylinders from being stored for excessive periods of time.

Valve protection caps must remain in place unless container is secured with valve outlet piping to use point. Close valve after each use and when the container is empty. Do not drag, slide or roll cylinders on their sides. Use a suitable hand truck for container movement. Use a pressure reducing regulator when connecting container to piping or systems. Do not use gas directly from container. Do not heat container by any means to increase the discharge rate of product from the container.

Never carry a compressed gas cylinder or a container of a gas in cryogenic liquid form in an enclosed space such as a car trunk, van or station wagon. A leak can result in a fire, explosion, asphyxiation or a toxic exposure.

Section 8- Exposure Controls/Personal Protection

EXPOSURE LIMITS[1]:

INGREDIENT	%VOLUME	PEL-OSHA[2]	TLV-ACGIH[3]	LD_{50} or LC_{50} Route/Species
Silicon Tetrahydride Formula: SiH_4 CAS: 7803-62-5 RTECS#: VV1400000	100	None Established	5 ppm TWA	LD_{50} 9600 ppm/4H (rat)

[1] Refer to individual state of provincial regulations, as applicable, for limits which may be more stringent than those listed here.

[2] As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)

[3] As stated in the ACGIH 1994-1995 Threshold Limit Values for Chemical Substances and Physical Agents.

ENGINEERING CONTROLS:
Use local exhaust ventilation to reduce concentrations to within current exposure limits. A laboratory type hood is suitable for handling small or limited quantities. Use general area ventilation to maintain oxygen levels above 19.5% by volume minimum.

EYE/FACE PROTECTION:
Safety goggles or glasses.

SKIN PROTECTION:
Protective gloves: neoprene, butyl rubber, PVC, polyethylene.

RESPIRATORY PROTECTION:
Airline respirators with full-face piece equipped with an escape bottle or a self-contained breathing apparatus should be available for emergency use. Operate this equipment in the positive pressure demand mode. Air purifying respirators must be equipped with suitable cartridges. Do not exceed maximum use concentrations.
Do not use air purifying respirators in an oxygen deficient/immediately dangerous to life and health (IDLH) atmosphere. Consult manufacturer's instructions before use.

OTHER/GENERAL PROTECTION:
Safety shoes, safety shower and eyewash.

Section 9- Physical and Chemical Properties

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Gas	
Vapor pressure	: Not Available	
Vapor density (Air = 1)	: Not Available	
Evaporation point	: Not Available	
Boiling point	: -170	^{o}F
	: -112	^{o}C
Freezing point	: -301	^{o}F
	: -185	^{o}C
pH	: Not Applicable	
Specific gravity at STP	: 1.1	
Oil/water partition coefficient	: Not Available	
Solubility (H20)	: Insoluble	
Odor threshold	: Not Available	
Odor and appearance	: Colorless gas with repulsive odor	

Section 10- Stability and Reactivity

STABILITY:
Stable
INCOMPATIBLE MATERIALS:
Concentrations greater than 3 molar percent are spontaneously combustible in air. Reacts with bases, halogens and other oxidizing agents.
HAZARDOUS DECOMPOSITION PRODUCTS:
Silicon and hydrogen at 788°F (420°C).
HAZARDOUS POLYMERIZATION:
Will not occur.

Section 11- Toxicological Information

Inhalation of low concentrations (less than 1 molar percent) of silane so that spontaneous ignition does not occur could react with basic solutions in the body liberating silicates and hydrogen.

Section 12- Ecological Information

No data given.

Section 13- Disposal Considerations

Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED, WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to Hynote or authorized distributor for proper disposal.

Section 14- Transport Information

DOT/IMO SHIPPING NAME: Silane
HAZARD CLASS: 2.1
IDENTIFICATION NUMBER: UN 2203
PRODUCT RQ: None
SHIPPING LABEL(s): FLAMMABLE GAS
PLACARD (when required): FLAMMABLE GAS

Section 15- Regulatory Information

Silane is listed under the accident prevention provisions of section 112(r) of the Clean Air Act (CAA) with a threshold quantity (TQ) of 10,000 pounds.
SARA TITLE III NOTIFICATIONS AND INFORMATION
SARA TITLE III - HAZARD CLASSES:
Acute Health Hazard

Fire Hazard
Sudden Release of Pressure Hazard
Reactivity Hazard

Section 16- Other Information

Compressed gas cylinders shall not be refilled without the express written permission of the owner. Shipment of a compressed gas cylinder which has not been filled by the owner or with his/her (written) consent is a violation of transportation regulations.

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