

# Hydrogen Material Safety Data Sheet

ISSUE DATE	01 March 2016	TRADE NAME AND SYNONYMS Hydrogen , or Liquid Hydrogen (in cryogenic liquid state)	CHEMICAL NAME AND SYNONYMS Hydrogen
REVISIONS	V1-02.2016	FORMULA H <sub>2</sub> MW : 2.016	CHEMICAL FAMILY Flammable Gas CAS #1333-74-0

## HEALTH HAZARD DATA

### EXPOSURE LIMITS

Hydrogen is a simple asphyxiant and has no threshold limit value (TLV). Hydrogen is not listed as a carcinogen by NTP, IARC or OSHA.

### SYMPTOMS IF INGESTED , CONTACTED WITH SKIN , OR VAPOR INHALED

Hydrogen is nontoxic and classified as a simple asphyxiant. Symptoms of anoxia occur only when gas concentrations are within the flammable range and the mixture has not ignited. **DO NOT ENTER WITHIN THE FLAMMABLE RANGE DUE TO THE IMMEDIATE FIRE AND EXPLOSION HAZARD.** Contact of skin with liquid hydrogen or cold gas vapors can cause cryogenic (extreme low temperature) burns and freeze tissues.

### TOXICOLOGICAL PROPERTIES

Hydrogen is nontoxic and classified as a simple asphyxiant , but is extremely flammable. The amount of hydrogen gas necessary to reduce concentration below life support levels is well within the flammable range. Do not enter areas containing flammable mixtures due to the immediate fire and explosion hazard.

### RECOMMENDED FIRST AID AND TREATMENT

If cryogenic liquid or cold boil-off gas contacts worker's skin or eyes , frozen tissues should be flooded or soaked with tepid water (105 - 115F; 41-46C). **DO NOT USE HOT WATER.** Cryogenic burns which result in blistering or deeper tissues freezing should be seen promptly by a physician. First degree burns (reddening only , as sunburn) , or second degree burns (blistering) which are the result of fire exposure and are localized to portion of an extremity or other small area of the body may be immersed in cool water for 10-20 minutes to relieve pain. **DO NOT immerse whole body in cold bath.** All thermal injuries except the most minor and localized burns should be referred promptly for medical care. Burned areas should be covered with the cleanest available available , such as a clean sheet , prior to transport. Do not use burn ointments or greasy materials or burns which show more than localized reddening. Persons suffering from lack of oxygen should be moved to areas with normal atmosphere. Assisted respiration and supplement oxygen should be given if the victim is not breathing.

## FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method Used) N/A (gas at normal temperature)	AUTO IGNITION TEMP 932F (500C)	FLAMMABLE LIMITS In air @ 1 atm	LEL 4.0%	UEL 74.2%
EXTINGUISHING MEDIA Dry chemical , Carbon Dioxide , or Halon	ELECTRICAL CLASSIFICATION GROUP Class I , Group B			

### SPECIAL FIRE FIGHTING PROCEDURES

Shut off sources of hydrogen. When possible , allow fire to burn itself out. Spray water on adjoining equipment to keep it cool.

### UNUSUAL FIRE AND EXPLOSION HAZARDS

Hydrogen can burn with almost an invisible flame of low thermal radiation. People have unknowingly walked into hydrogen flames. Easily ignited; minimum ignition energy is low (0.2MJ) and flammable range is wide. Flame propagates at rapid rate. Potential explosion hazard from reignition if fire extinguished without shutting off hydrogen source. Hydrogen gas is buoyant and can accumulate in the upper sections of enclosed spaces.

## PHYSICAL DATA

BOILING POINT (°F) @ 1 atm - 423.0F (-252.8 C)	FREEZING POINT (°F) @ 1 atm - 434.5F (-259.2C)		
VAPOR PRESSURE (psia) N/A	SOLUBILITY IN WATER @ 68F (20C) , 1 atm 1.82% by volume		
VAPOR DENSITY (lb/cu ft) @ 68F (20C) , 1 atm 0.005229	SPECIFIC GRAVITY (AIR = 1) @ 68F (20C) , 1 atm 0.0696	LIQUID DENSITY (lb/uc ft) @ boiling point , 1 atm 4.432	SPECIFIC GRAVITY (H2O=1) @ boiling point , 1 atm 0.0710

### APPEARANCE AND ODOR

Both liquid and gaseous hydrogen are colorless and odorless.

REACTIVITY DATA			
STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	Sources of ignition , sparks , flames , hot objects.
INCOMPATIBILITY (Materials to avoid)			
Oxidizing materials. Some steels are susceptible to hydrogen attack or embrittlement at high temperature and pressure.			
HAZARDOUS DECOMPOSITION PRODUCTS			
None			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	None
SPILL OR LEAK PROCEDURES			
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED			
DO NOT ENTER areas containing flammable mixtures of hydrogen in air. Avoid contact of skin with liquid hydrogen or cold or boil-off gas. Ventilate enclosed areas to prevent formation of flammable or oxygen-deficient atmosphere. See " VENTILATION" below. Eliminate potential sources of ignition. Move a leaking compressed gas cylinder out of doors if leak is small.			
WASTE DISPOSAL METHOD			
Do not attempt to dispose of residual gaseous hydrogen in cylinders. Return cylinders with positive residual pressure, cylinders valves tightly closed , and valve cap in place. Do not dispose of liquid hydrogen.			
SPECIAL PROTECTION INFORMATION			
RESPIRATORY PROTECTION (Specify Type)			
None			
VENTILATION Natural or mechanical where gas or vapors are present	LOCAL EXHAUST As necessary	SPECIAL Mechanical ventilation must meet National Electric Code (NEC) requirements for Class I , Group B.	
	MECHANICAL (General) As necessary	OTHER Only as necessary	
PROTECTIVE GLOVES			
(Liquid) Loose-fitting of impermeable materials , such as leather. Leather work gloves are recommended when handling compressed gas cylinders.			
EYE PROTECTION			
Safety glasses are recommended when handling high pressure cylinders. Use safety glasses or goggles when handling liquid.			
OTHER PROTECTIVE EQUIPMENT			
None			
SPECIAL PRECAUTIONS *			
SPECIAL LABELLING INFORMATION			
DOT Shipping Name : Hydrogen , or Hydrogen , compressed; (Liquid) Hydrogen , refrigerated liquid.			
DOT Hazard Class : Flammable Gas DOT Shipping Label : Flammable Gas			
I.D. Number : UN 1049 (Hydrogen or hydrogen , Compressed) ; UN 1966 (Liquid Hydrogen)			
SPECIAL HANDLING RECOMMENDATIONS			
Prevent contact of liquid hydrogen with exposed skin. Prevent entrapment of liquid in closed systems. Use only in well ventilated areas. Compressed gas cylinders contain hydrogen at extremely high pressure and should be handled with care. Use a pressure reducing regulator when connecting to lower pressure piping systems. Secure cylinders when in use. Never use direct flame to heat a compressed gas cylinder. Use a check valve to prevent backflow into storage container. Avoid dragging , rolling , or sliding cylinders , even for a short distance. Use a suitable hand truck.			
SPECIAL STORAGE RECOMMENDATIONS			
Store liquid containers and cylinders in well ventilated areas. Keep cylinders away of sources of heat. Storage should not be in heavy traffic areas to prevent accidental knocking over or damage from passing or falling objects. Valve caps should remain on cylinders not connected for use. Segregate full and empty cylinders. Storage areas should be free of combustible material. Avoid exposure to areas where salt or other corrosive chemicals are present. Cylinder storage of hydrogen should be segregated from oxidizers such as oxygen , fluorine ,etc.			
OTHER RECOMMENDATIONS OR PRECAUTIONS			
Liquid hydrogen in exposed piping can actually cause air to condense and liquified. The nitrogen in this liquid can evaporate more rapidly , leaving an oxygen enriched liquid behind. Utilize oxygen-compatible insulating materials and minimize exposed piping surface areas. Use only metals and materials compatible with extremely low temperatures. Avoid use of carbon steel and other materials which become brittle at low temperatures. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases.			