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Boise, ID 83705
208-336-1643

Emergency Telephone Number: Chemtrec (800) 424-9300
Or Norco (208) 336-1643

PRODUCT NAME: HYDROGEN

MATERIAL SAFETY DATA SHEET

Identification

Product Name: Hydrogen
CAS Number: 1333-74-0
Chemical Family: Permanent Gas
Chemical Formula: H₂
Common Names/Synonyms: Dihydrogen, Parahydrogen, Refrigerant gas R702
MSDS Identification Number: 1049
Prepared By: Quality Dept.

Revision Date: 10/26/07
Last Review Date: 05/31/12

Composition/Information on Ingredients

Exposure Limits¹:

INGREDIENT	% VOLUME	PEL-OSHA ²	TLV-ACGIH ³	LD ₅₀ or LC ₅₀ Route/Species
Hydrogen Formula: H ₂ CAS #: 1333-74-0 RTECS #: MW8900000	99.0% to 99.99%	None Established	Simple Asphyxiant	Not Available

¹ Refer to individual state or 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 2007 Threshold Limit Values for Chemical Substances and Physical Agents

OSHA Regulatory Status: This material is classified as hazardous under OSHA regulations.

Hazards Identification

Emergency Overview:

Odorless, colorless, extremely flammable gas. Dangerous fire and explosion hazard. Avoid heat, sparks, and flames. Simple Asphyxiant – This product does not contain oxygen and may cause asphyxia if released in a confined area. Maintain oxygen levels above 19.5%. Contents under pressure. Use and store below 125 °F (52 °C).

Route of Entry:

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

Health Effects:

Exposure Limits	Irritant	Sensitization
No	No	No
Teratogen	Reproductive Hazard	Mutagen
No	No	No

Synergistic Effects:
None Reported

Carcinogenicity: NTP: No IARC: No OSHA: No

Hazards Identification Continued

Eye Effects:

None anticipated. Contact with rapidly expanding gas near the point of release may cause frostbite.

Skin Effects:

Contact with rapidly expanding gas near the point of release may cause frostbite with redness, skin color change to gray or white and blistering.

Ingestion Effects:

Ingestion is unlikely.

Inhalation Effects:

Product is a simple asphyxiant. High concentrations may exclude an adequate supply of oxygen to the lungs. Effects of oxygen deficiency resulting from simple asphyxiants may include: rapid breathing, diminished mental alertness, impaired muscular coordination, faulty judgment, depression of all sensations, emotional instability, and fatigue. As asphyxiation progresses, nausea, vomiting, prostration, and loss of consciousness may result, eventually leading to convulsions, coma, and death.

Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.

Medical Conditions Aggravated by Exposure:

None known.

Potential Environmental Effects:

Ecotoxicity values were unavailable. Not expected to be toxic to fish and wildlife.

NFPA Hazard Codes

Health: 0
Flammability: 4
Instability: 0

HMIS Hazard Codes

Health: 0
Flammability: 4
Physical Hazard: 3

Ratings System

0 = No Hazard
1 = Slight Hazard
2 = Moderate Hazard
3 = Serious Hazard
4 = Severe Hazard

Hazard codes based on recommendations contained in CGA P-19 2004, CGA Recommended Hazard Ratings for Compressed Gases, 2nd edition.

First Aid Measures

Eyes:

None required for gas. If frostbite is suspected, flush eyes with cool water for 15 minutes and obtain immediate medical attention.

Skin:

None required for gas. For frostbite, immerse skin in lukewarm water. DO NOT USE HOT WATER. Obtain medical attention.

Ingestion:

Ingestion is unlikely as product is a gas at room temperature.

Inhalation:

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO PRODUCT. RESCUE PERSONNEL SHOULD BE EQUIPED WITH SELF-CONTAINED BREATHING APPARATUS. Victims 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, and if breathing has stopped, administer artificial respiration and supplemental oxygen. Further treatment should be symptomatic and supportive.

Fire Fighting Measures

Conditions of Flammability: Flammable Gas		
Flash point: Not Available	Method: Not Applicable	Autoignition Temperature: 932 °F (500 °C)
LEL (%): 4	UEL (%): 75	
Hazardous combustion products: None		
Sensitivity to mechanical shock: None		
Sensitivity to static discharge: Yes		

Fire and Explosion Hazards:

Extremely flammable gas. Hydrogen burns with an almost invisible flame. High pressure releases may ignite with no apparent ignition source possibly via static electricity. Rapid flame propagation and flashback possible. Easily ignited over a wide range of concentrations in air. Cylinders may rupture violently or vent rapidly from pressure when involved in a fire situation.

Extinguishing Media:

Stop the flow of gas before extinguishing fire. Water, dry chemical, carbon dioxide.

Fire Fighting Instructions:

If possible, stop the flow of gas. Inerting the atmosphere to reduce oxygen levels may extinguish flame, allowing capping of leaking container. Do not attempt this unless specifically trained. Reduce the rate of flow and inject an inert gas, if possible, before completely stopping the flow to prevent flashback. Do not extinguish the fire until the supply is shut off as otherwise an explosive re-ignition may occur. If the fire is extinguished and the flow of gas continues, use increased ventilation to prevent build-up of explosive atmosphere. Use non-sparking tools to close container valves.

Use water spray to cool surrounding containers. Be cautious of a Boiling Liquid Evaporating Vapor Explosion, BLEVE, if flame is impinging on surrounding containers. Direct 500 GPM water stream onto containers above liquid level with remote monitors. Limit the number of personnel in proximity of fire and evacuate surrounding areas in all directions.

Firefighters should wear respiratory protection (SCBA) and full turnout or Bunker gear. Continue to cool fire-exposed cylinders until well after flames are extinguished.

Accidental Release Measures

Immediately extinguish all ignition sources and evacuate all personnel from affected area. No smoking, flares, sparks, or flames in hazard area. Use appropriate protective equipment. Stop the flow of gas or remove cylinder to outdoor location if this can be done without risk. Provide maximum explosion proof ventilation and ventilate enclosed areas. If leak is in container or container valve contact the appropriate emergency telephone number listed in Section 1 or call your closest Norco/NorLab location. If leak is in user's equipment, be certain to purge piping with inert gas prior to attempting repairs.

Handling and Storage

Electrical Classification:

Class 1, Group B

Earth-ground and bond all lines and equipment associated with the hydrogen system. All equipment should be non-sparking or explosion proof. Separate hydrogen from oxygen and other oxidizers by a minimum distance of 20 ft. or by a 5ft. high barrier with a minimum fire resistance rating of a half hour.

This gas is noncorrosive. However, hydrogen can interact with some metals (hardened steels) to cause embrittlement.

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure regulator when connecting cylinder to lower pressure piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. Do not insert any object (i.e.: screwdriver) into valve cap openings as this can damage the valve causing leakage.

Handling and Storage Continued

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavy traffic 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.

For additional recommendations consult Compressed Gas Association Pamphlet P-1.

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.

Exposure Controls, Personal Protection

Engineering Controls:

Use local exhaust and general ventilation systems prevent build up of flammable concentrations. Small quantities can be handled in forced ventilation hoods. If product is handled routinely where the potential for leaks exists, all electrical equipment must be rated for use in potentially flammable atmospheres. Consult the National Electrical Code for details.

Eye/Face Protection:

Safety goggles or glasses.

Skin Protection:

Protective gloves of suitable material. Cotton clothing is recommended to prevent static build-up.

Respiratory Protection:

For emergency release use a positive pressure NIOSH approved air-supplying respirator system (SCBA or airline/escape bottle) using at a minimum Grade D air.

Other/General Protection:

Safety shoes, emergency eyewash station.

Physical and Chemical Properties

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Gas	
Vapor pressure at 70°F	: Not Available	psia
Vapor density at STP (Air=1)	: 0.069 (Gas)	
Evaporation point	: Not Available	
Boiling Point	: -423.2	°F
	: -252.8	°C
Freezing point	: -434.8	°F
	: -259.2	°C
pH	: Not Available	
Specific gravity (H ₂ O = 1 at 77°F and 1 atm.)	: Not Available	
Oil/water partition coefficient	: Not Available	
Solubility (H ₂ O)	: Very slight	(vol. /vol.)
Odor threshold	: Not Applicable	
Odor and appearance	: Colorless odorless gas	

Stability and Reactivity

Stability:

Stable.

Incompatible Materials:

Oxidizers. Avoid heat, sparks, and flame. Hydrogen ignites in bromine fluoride and explodes in nitrile fluoride.

Stability and Reactivity Continued

Hazardous Decomposition Products:

None

Hazardous Polymerization:

Will not occur.

Toxicological Information

Skin & Eye:

Not expected to cause skin or eye irritation

Inhalation:

Hydrogen acts as a simple asphyxiant. Maintain atmospheric oxygen at or above 19.5%.

Ecological Information

No adverse ecological effects expected. Product does not contain any Class I or Class II ozone-depleting chemicals. Not toxic. Will not bioconcentrate.

Disposal Considerations

Do not attempt to dispose of residual waste or unused quantities in returnable containers. Return in shipping container, *properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place* to Norco for proper disposal. Non-refillable containers should be vented in a well-ventilated area then disposed of in compliance with local regulations, or returned to Norco/NorLab.

Transport Information

Parameter	United States DOT	Canada TDG
Proper Shipping Name:	Hydrogen, compressed	Hydrogen, compressed
Hazard Class:	2.1	2.1
Identification Number:	UN 1049	UN 1049
Shipping Label:	Flammable Gas	Flammable Gas

Regulatory Information

SARA Title III Notifications and Information:

This product does not contain toxic chemicals subject to reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372.

SARA Title III – Hazard Classes:

Fire Hazard

Sudden Release of Pressure Hazard

California Proposition 65:

This product does not contain ingredient(s) known to the State of California to cause cancer or reproductive toxicity.

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.

Disclaimer of Expressed and Implied Warranties:

Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).