

PRODUCT NAME: HYDROGEN, COMPRESSED GAS
1. Chemical Product and Company Identification

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PRODUCT NAME: HYDROGEN

CHEMICAL NAME: Hydrogen

COMMON NAMES/SYNONYMS: Hydrogen

2. Composition, Information on Ingredients

Ingredient	% Volume	TLV-ACGIH ²
Hydrogen FORMULA: H ₂	≥ 99.8	Simple Asphyxiant

3. Hazards Identification
EMERGENCY OVERVIEW

Simple Asphyxiant - This product does not contain oxygen and may cause asphyxia if released in a confined area. Maintain oxygen levels above 19.5%. Flammable.

ROUTE OF ENTRY:

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

HEALTH EFFECTS:

Exposure Limits: No
 Irritant: No
 Sensitization: No
 Teratogen: No
 Reproductive Hazard: No
 Mutagen: No
 Synergistic Effects: None reported

EYE EFFECTS:

None known.

SKIN EFFECTS:

None known.

INGESTION EFFECTS:

None known. Ingestion is unlikely as product is gas at room temperature.

PRODUCT NAME: HYDROGEN, COMPRESSED GAS**INHALATION EFFECTS:**

Product is a non-toxic simple Asphyxiant. High concentrations may exclude an adequate supply of oxygen to the lungs. Effects of oxygen deficiency resulting from simple Asphyxiant may include: rapid breathing, diminished mental alertness, impaired muscular coordination, and 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.

4. First Aid Measures**EYES:**

None required.

SKIN:

None required.

INGESTION:

None required.

INHALATION:

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED 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 resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

5. Fire Fighting Measures

Conditions of Flammability	Flash Point	Method
Flammable	Not available	Not applicable
Auto-ignition Temperature	LEL %	UEL %
	4	74.5
Hazardous combustion products	Sensitivity to mechanical shock	Sensitivity to static discharge
None	None	Not available

FIRE AND EXPLOSION HAZARDS:

Extremely flammable gas. Hydrogen is very light and may collect in the upper portions of storage areas. Hydrogen burns with an almost invisible flame.

EXTINGUISHING MEDIA:

Water, Dry chemical, Carbon dioxide.

FIRE FIGHTING INSTRUCTIONS:

If possible, stop the flow of gas mixture. Use water spray to cool surrounding containers. A water fog may be used to create ventilation. Ventilation fans must be explosion proof.

6. Accidental Release Measures

Be certain to purge piping with inert gas prior to attempting repairs. If leak is in container or container valve, contact the appropriate person in **Linde Gas Middle East LLC**

PRODUCT NAME: HYDROGEN, COMPRESSED GAS**7. Handling and Storage****Electrical Classification:**

Class 1, Group B.

Earth-ground and bond all lines and equipment associated with the hydrogen system. Electrical equipment should be non-sparking and explosion proof. This gas mixture is non-corrosive. 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 protection outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure-reducing regulator when connecting cylinder to lower pressure (<3000 psig) 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.

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where falling or being knocked over. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time.

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.

8. Exposure Controls, Personal Protection**EXPOSURE LIMITS¹:**

Ingredient	% Volume	TLV-ACGIH ²
Hydrogen FORMULA: H ₂	≥ 99.8	Simple Asphyxiant

ENGINEERING CONTROLS:

Local exhaust to prevent accumulation of high concentrations so as to reduce the oxygen level in the air to less than 19.5% and to keep gas mixture below lower explosive limit (4 %).

EYE/FACE PROTECTION:

Safety goggles or glasses as appropriate for the job.

SKIN PROTECTION:

Protective gloves of material appropriate for the job.

RESPIRATORY PROTECTION:

Positive pressure air line with full-face mask and escape bottle or self-contained breathing apparatus should be available for emergency use.

OTHER/GENERAL PROTECTION:

Safety shoes or other footwear as appropriate for the job.

PRODUCT NAME: HYDROGEN, COMPRESSED GAS**9. Physical and Chemical Properties**

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Gas	
Vapor pressure	: Supercritical	
Vapor density at 0 o C (Air = 1)	: 0.069	
Evaporation point	: Not Available	
Boiling point	: -423.2	
	: -252.8	
Freezing point	: -434.8	
	: -259.2	
PH	: Not Applicable	
Specific gravity	: Not Available	
Oil/water partition coefficient	: Not Available	
Solubility (H2O)	: Slight	
Odor threshold	: Not Applicable	
Odor and appearance	: Colorless, odorless gas	

10. Stability and Reactivity**STABILITY:**

Stable

INCOMPATIBLE MATERIALS:

Oxidizers. Fluorine and hydrogen react at 418 o F (-250 o C) when impurities are present. Chlorine/hydrogen mixtures explode if exposed to light. Lithium metal will burn in hydrogen atmosphere.

HAZARDOUS POLYMERIZATION:

Does not occur.

11. Toxicological Information

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

12. 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 **Linde Gas Middle East LLC** or authorized distributor for proper disposal.

13. Transport Information

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

14. Hazard Classes

Fire Hazard

Sudden Release of Pressure Hazard

PRODUCT NAME: HYDROGEN, COMPRESSED GAS**15. 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 (written) consent, is a violation of transportation regulations.

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:

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