

MATERIAL  
SAFETY  
DATA SHEET

<b>PRODUCT NAME</b> Hydrogen	<b>CAS#</b> 1333-74-0
<b>TRADE NAME AND SYNONYMS</b> Hydrogen; Hydrogen, compressed	<b>DOT I.D. NO.</b> UN 1049
<b>CHEMICAL NAME AND SYNONYMS</b> Hydrogen	<b>DOT HAZARD CLASS</b> Division 2.1 (Flammable gas)
<b>ISSUE DATE AND REVISIONS</b> Revised June 2007	<b>FORMULA</b> H <sub>2</sub>

### HEALTH HAZARD DATA

<b>EMERGENCY OVERVIEW</b>  Hydrogen is a flammable, colorless, odorless, compressed gas. It poses an immediate fire and explosive hazard when concentrations exceed 4%.
<b>SYMPTOMS OF EXPOSURE</b>  <u>Inhalation:</u> Asphyxiant. Before suffocation could occur, the lower flammability limit of hydrogen in air would be exceeded possibly causing both an oxygen-efficient and explosive atmosphere. Exposure to moderate concentrations may cause dizziness, headache, nausea and unconsciousness. Exposure to atmospheres containing 8-10% or less oxygen will quickly bring about unconsciousness without warning leaving individuals unable to protect themselves. Lack of sufficient oxygen may cause serious injury or death <u>Symptoms:</u> Exposure to an oxygen-deficient atmosphere(<19.5%) may cause dizziness, drowsiness, nausea, vomiting, excess salivation, diminished mental alertness, loss of consciousness, and death.
<b>TOXICOLOGICAL PROPERTIES</b>  Hydrogen is nontoxic but can act as an asphyxiant by displacing the necessary amount of air required supporting life.
<b>RECOMMENDED FIRST AID TREATMENT</b>  PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO HYDROGEN. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF EXTREME FIRE AND EXPLOSION HAZARD.  <u>Inhalation:</u> Persons suffering from lack of oxygen should be removed to fresh air. If victim is not breathing, administer artificial respiration. If breathing is difficult, administer oxygen. Obtain prompt medical attention.  SKIN CONTACT/ EYE CONTACT/ INGESTION: None

**HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES**

Hydrogen is flammable over a very wide range in air.

**PHYSICAL DATA**

<b>BOILING POINT</b> -423 °F (-252.8 °C)	<b>CRITICAL TEMPERATURE</b> 362.5°F
<b>MOLAR SPECIFIC HEAT (25 °C, 1 bar abs, contact pressure)</b> 28.851 J / (mol. °K)	<b>CRITICAL PRESSURE</b> 12.97 bar abs
<b>SOLUBILITY IN WATER</b> 0.019 at 60°F (Very Slightly)	<b>SPECIFIC VOLUME(21.1 °C, 1 bar abs)</b> 11.99 m <sup>3</sup> /kg at 70°F
<b>EVAPORATION RATE</b> N/A	<b>SPECIFIC GRAVITY (AIR=1)</b> 0.06960 at 32°F
<b>APPEARANCE AND ODOR</b> Colorless gas and odorless	

**FIRE AND EXPLOSION HAZARD DATA**

<b>FLASH POINT (Method used)</b> Flammable gas	<b>EXTINGUISHING MEDIA</b> CO <sub>2</sub> , dry chemical, Water spray or fog for surrounding area.	<b>FLAMMABLE LIMITS % BY VOLUME</b> LEL 4% UEL 74%
<b>SPECIAL FIRE FIGHTING PROCEDURES</b> Wear Self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Immediately cool container with water spray from maximum distance, taking care not to extinguish flames. If flames are accidentally extinguished, explosive re-ignition may occur. Stop flow of gas if without risk while continuing cooling water spray.		
<b>UNUSUAL FIRE AND EXPLOSION HAZARDS</b> Burns with a pale blue, nearly invisible flame. Hydrogen is easily ignited with low-ignition energy, including static electricity. Hydrogen is lighter than air and can accumulate in the upper sections of enclosed spaces. Pressure in a container can build up due to heat, and it may rupture if pressure relief devices should fail to function.		

**REACTIVITY DATA**

<b>STABILITY</b>		<b>CONDITIONS TO AVOID</b>
Unstable		None
Stable	X	
<b>INCOMPATIBILITY (Materials to avoid)</b> Oxidizing agents. Some steels are susceptible to hydrogen embrittlement at high pressure and temperatures.		
<b>HAZARDOUS POLYMERIZATION</b>		<b>HAZARDOUS THERMAL DECOMPOSITION PRODUCTS</b>
May Occur		None
Will Not Occur	X	

**SPILL OR LEAK PROCEDURES**

<b>STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED</b> Evacuate immediate area. Eliminate any possible sources of ignition, and provide maximum explosion-proof ventilation. Shut off source of hydrogen, if possible. If leaking from cylinder, or valve, call the Air Products' emergency phone number.
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**WASTE DISPOSAL METHOD**

Do not attempt to dispose of residual or unused product in the cylinder. Return to supplier for safe disposal. Residual product within process system may be vented at a controlled rate, to the atmosphere through a vent stack that discharges to an elevated point. This stack should be in an isolated area away from ignition sources.

**SPECIAL PROTECTION INFORMATION****RESPIRATORY PROTECTION (Specify type)**

Air supplied respirators are required in oxygen-deficient atmospheres. Before entering area you must check for flammable or oxygen-deficient atmospheres.

**MECHANICAL (Gen.)**

Recommended

**OTHER**

N/A

**SPECIAL**

N/A

**PROTECTIVE GLOVES**

Recommend to use work gloves when handling cylinders.

**EYE PROTECTION**

Recommend to wear safety glasses when handling cylinders.

**OTHER PROTECTIVE EQUIPMENT**

Recommend to wear safety shoes when handling cylinders.

**SPECIAL PRECAUTIONS\*****SPECIAL LABELING INFORMATION**

DOT Shipping Name: Hydrogen  
DOT Shipping Label: Flammable gas

DOT Hazard Class: Division 2.1  
I.D. No.: UN 1049

**SPECIAL HANDLING RECOMMENDATIONS**

Do not "open" hydrogen cylinder valve before connecting it, since self-ignition may occur. Use only approved CGA connections. **DO NOT USE ADAPTERS.** Never insert an object (e.g. wrench, screwdriver, etc) into valve cap openings. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit.

**SPECIAL STORAGE RECOMMENDATIONS**

Store the cylinders upright with valve protection cap in place. Never allow the cylinders to reach a temperature above 52°C. Keep away from sources of ignitions.

**OTHER RECOMMENDATIONS OR PRECAUTIONS**

Use piping and equipment adequately designed to withstand pressures to be encountered. Always use check valve or protection apparatus in any line or piping from the cylinder to prevent backflow. Never strike an arc on compressed gas cylinder or make a cylinder a part of an electrical circuit.

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