

MATERIAL SAFETY DATA SHEET

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1. CHEMICAL PRODUCT

PRODUCT NAME: **HYDROGEN**

SYNONYMS: None

2. COMPOSITION, INFORMATION ON INGREDIENTS

Ingredient Name	Formula	CAS #	Concentration	Exposure Limits (PPM)			
				ACGIH TLV	OSHA PEL	MAC	Other STEL
HYDROGEN	H2	1333-74-0	99+%	S/A	S/A	S/A	S/A

Note: NE = NONE ESTABLISHED

S/A = SIMPLE ASPHYXIAN

3. HAZARD IDENTIFICATION

* * * EMERGENCY OVERVIEW * * *

Flammable high pressure gas.
Can form explosive mixtures with air.
May ignite if valve is open to air.
Burns with an invisible flame.

POTENTIAL HEALTH EFFECTS

ROUTES OF ENTRY: Inhalation

ACUTE EFFECTS: Material acts as a simple asphyxiant by displacing air necessary for life. Symptoms include rapid respiration, muscular incoordination, fatigue, dizziness, nausea, vomiting, unconsciousness, and death.

CHRONIC EFFECTS: None known

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: None known

OTHER EFFECTS OF OVEREXPOSURE: None

CARCINOGENICITY (US ONLY):

NTP - No

IARC MONOGRAPHS - No

OSHA REGULATED - No

4. FIRST AID MEASURES

INHALATION: Immediately remove victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.

EYE CONTACT: None

SKIN CONTACT: None

INGESTION: None

IN EVENT OF EXPOSURE, CONSULT A PHYSICIAN

NOTE TO PHYSICIAN: None

5. FIRE FIGHTING MEASURES

FLASH POINT: Gas

AUTOIGNITION TEMPERATURE: 500 deg.C

FLAMMABLE LIMITS:

LOWER: 4%

UPPER: 75%

EXTINGUISHING MEDIA: Dry chemical, carbon dioxide, or halogenated gas.

SPECIAL FIRE FIGHTING INSTRUCTION AND EQUIPMENT: Wear self-contained breathing apparatus and full protective clothing. Do not extinguish a gas fire unless immediate shut-off of gas flow is possible. Explosive vapor could form. Keep fire exposed cylinders cool with water spray.

HAZARDOUS COMBUSTION PRODUCTS: None

UNUSUAL FIRE AND EXPLOSION HAZARDS: Cylinder rupture may occur under fire conditions. Severe when exposed to heat or flame. Contact with strong oxidizers may cause a fire or explosion. Pure **hydrogen** burns with a pale, blue, nearly invisible flame. Vapors may travel a considerable distance to the source of ignition and flash back.

6. ACCIDENTAL RELEASE MEASURES

CLEAN UP PROCEDURES: Evacuate and ventilate area. Shut off source if possible and remove source of heat. Remove leaking cylinder to exhaust hood or safe outdoor area. Allow gas to dissipate.

SPECIALIZED EQUIPMENT: None

7. HANDLING AND STORAGE

PRECAUTIONS TO BE TAKEN IN HANDLING: Secure cylinder when using to protect from falling. Use suitable hand truck to move cylinders. No part of cylinder should be exposed to temperatures above 52 degrees celsius. Return to supplier with positive pressure.

PRECAUTIONS TO BE TAKEN IN STORAGE: Store in well ventilated areas. Keep valve protection cap on cylinders when not in use. Quantities greater than 400 standard cubic feet should be stored in specially ventilated rooms or outside. Store away from oxidizers, combustible materials, and source of ignition or heat. Ventilation equipment should be explosion proof.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS: Provide adequate general and local exhaust ventilation to maintain concentrations below flammable limits and to avoid asphyxiation.

EYE / FACE PROTECTION: Safety glasses

SKIN PROTECTION: None

RESPIRATORY PROTECTION: In case of leakage, use self-contained breathing apparatus.

OTHER PROTECTIVE EQUIPMENT: Safety shoes when handling cylinders.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Colorless

ODOR: Odorless

PHYSICAL PRESSURE: Gas

VAPOR PRESSURE: Gas

VAPOR DENSITY (AIR=1): 0.07

BOILING POINT (C): -252

SOLUBILITY IN WATER: @20 deg.C: 1.82%

SPECIFIC GRAVITY (H2O=1): Gas

EVAPORATION RATE: Gas

ODOR THRESHOLD: N/Ap

10. STABILITY AND REACTIVITY

STABILITY: Stable under normal storage conditions.

CONDITIONS TO AVOID: Storage in poorly ventilated areas. Storage near a heat source.

MATERIALS TO AVOID: Oxidizing agents: **hydrogen** can react with some metals (i.e. hardened steel) to cause embrittlement, alkaline materials, halogens.

HAZARDOUS POLYMERIZATION: Will not occur.

HAZARDOUS DECOMPOSITION: None

11. TOXICOLOGICAL INFORMATION

LETHAL CONCENTRATION (LC50): NONE ESTABLISHED

LETHAL DOSE 50 (LD50): N/Ap

TERATOGENICITY: N/Ap

REPRODUCTIVE EFFECTS: N/Ap

MUTAGENICITY: N/Ap

12. ECOLOGICAL INFORMATION

No adverse ecological effects are expected.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD: Non-returnable cylinders must not be refilled. Dispose of non-refillable cylinders in accordance with federal, state, and local regulations. Allow gas to discharge at a moderate rate. Return cylinders to supplier with any valve outlet plugs or caps secured and valve protection cap in place.

14. TRANSPORT INFORMATION

CONCENTRATION: 99+%

DOT DESCRIPTION (US ONLY):

PROPER SHIPPING NAME: **Hydrogen**, compressed

HAZARD CLASS: 2.1 (flammable)

IDENTIFICATION NUMBER: UN1049

REPORTABLE QUANTITIES: None

LABELING: FLAMMABLE GAS

ADR / RID (EU Only): Class 2,1f

SPECIAL PRECAUTIONS: Cylinders should be transported in a secure upright position in a well ventilated truck.

15. REGULATORY INFORMATION

OSHA: Process Safety Management: Material is not listed in appendix A of 29 CFR 1910.119 as highly hazardous chemical.

TSCA: Material is listed in TSCA inventory.

SARA: The threshold planning quantity for material is 10,000 lbs.

EU NUMBER: 215-605-7

NUMBER IN ANNEX 1 OF DIR 67/548: Material is listed in annex 1.

EU CLASSIFICATION: N/Av

R: 12

S: 9-16-33

16. OTHER INFORMATION

OTHER PRECAUTIONS: Protect containers from physical damage. Do not deface cylinders or labels. Cylinders should be refilled by qualified producers of compressed gas. Shipment of a compressed gas cylinder which has not been filled by the owner or with his written consent is a violation of federal law (49 CFR).

ABBREVIATIONS: N/Ap - Not Applicable N/Av - Not Available SA - Simple Asphyxiant NE - None Established

Use proper connections; do not use adapters. Do not force fit!!

DISCLAIMER

The information and recommendations in this Material Safety Data Sheet relate only to the specific material mentioned herein and do not relate to use otherwise ie.in combination with any other material or in any process.

The information and recommendations herein are taken from our extensive experiences and the data contained in recognized references and believed by us to be true. Refrigeration group of companies make no warranties either expressed or implied with respect there to and assume no liability in connection with the use of such information and recommendation.