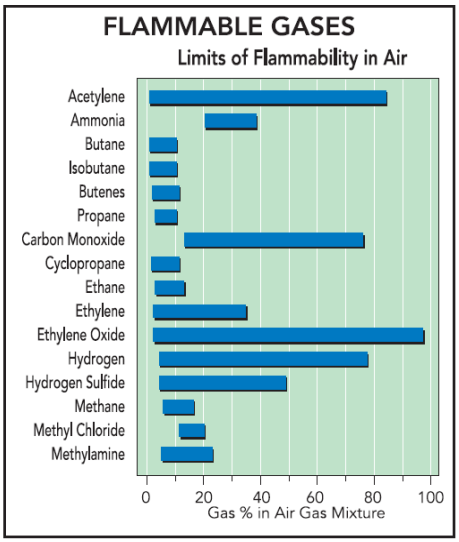
HYDROGEN GAS

Introduction



Hydrogen, or H_2, is the lightest of all gases. Hydrogen is a colorless, odorless, tasteless and nontoxic. Hydrogen exists as a gas at atmospheric temperatures and pressures. A stable molecule because of its high bond strength, hydrogen becomes reactive at elevated temperatures or with the aid of catalysts.

When cooled to its boiling point of -423°F (-253°C), hydrogen becomes a liquid that is approximately 93 percent lighter than water.

Hazards

Hydrogen is flammable and can act as a simple asphyxiant by displacing the oxygen in the air. In addition, when in its liquid form, it may cause severe frostbite to the eyes and skin.

Hydrogen is flammable and burns in air with a pale blue, almost invisible flame. In its gaseous form, hydrogen dissipates quickly. These unique properties call for strict safety measures in hydrogen use and storage.

Precaution to Take When Handling

- ***Keep away from heat, sparks, and open flame.*** Use only spark-proof tools and explosion-proof equipment.
- ***Protect cylinders from damage.*** Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop.
- ***Hydrogen is the lightest known gas.*** It may leak out of systems that are air-tight for other gases and may collect in poorly ventilated upper reaches of buildings. Leak check system with soapy water; never use a flame.
- ***All piped hydrogen systems and associated equipment must be grounded.*** Electrical equipment must be non-sparking or explosion-proof.

- ***Do not crack or open hydrogen cylinder valves unless connected to utilization equipment;*** escaping gas may ignite spontaneously. Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. Close cylinder valve after each use; keep closed even when empty.

- ***Never attempt to lift a cylinder by its cap;*** the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, and pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps.

Storage:

- ***Store and use with adequate ventilation.*** Store only where temperature will not exceed 125°F (52°C).

- ***Separate hydrogen cylinders from oxygen, chlorine, and other oxidizers*** by at least 20 ft. (6.1 m), or use a barricade of noncombustible material. This barricade should be at least 5 ft. (1.53 m) high and have a fire resistance rating of at least ½ hour.

- ***Always secure cylinders upright to keep them from falling or being knocked over.*** Install valve protection cap, if provided, firmly in place by hand when the cylinder is not in use.

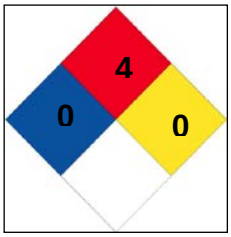
- ***Post "No Smoking or Open Flames" signs in storage and use areas.*** There must be no sources of ignition. All electrical equipment in storage areas must be explosion-proof. Storage areas must meet national electric codes for Class hazardous areas.

- ***Store full and empty cylinders separately.*** Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

- ***Limited Storage of Hydrogen cylinders/total cubic feet of gas per fire control area.*** The total quantity of hydrogen gas is limited based on location within the building, the methods of storage (i.e. gas cabinet) and the design of the building's fire suppression and protection systems. Refer to the Massachusetts 780 CMR: State Board of Building Regulations and Standards – *Chapter 3 Uses or Occupancy and Chapter 4 Special Uses and Occupancy*.

- ***The Use of a Flash Arrestor -*** Whenever a flammable gas is to be used it is recommended that a simple flash arrestor be installed in the line. Flashback is the reversing of the flame such that it travels through the line back into the pressure regulator or cylinder.

REFERENCES:



Safety Data Sheet Link: MATHESON ask. . .The Gas Professionals™

Compressed Gas Association as defined in *Pamphlet G-1: SB-8: Use of Oxy-fuel Gas Welding and Cutting Apparatus*

Compressed Gas Association, Inc., *Pamphlet G-5: Hydrogen*

Matheson Gas – *Safe Handling of Compressed Gases in the Laboratory and Plant*

Massachusetts Board of Fire Prevention 527 CMR 14.00 - *Flammable liquids, Combustible liquids, Flammable solids and Flammable gases.*

Massachusetts 780 CMR: *State Board of Building Regulations and Standards – Chapter 3 Use or Occupancy*

Massachusetts 780 CMR: *State Board of Building Regulations and Standards – Chapter 4 Special Use and Occupancy*

NFPA 45: *Fire Protection for Laboratories Using Chemicals, National Fire Protection Association*

NFPA 51: *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting and Allied Processes*

NFPA 55: *Storage, Use and Handling of Compressed and Liquefied Gases in Portable Cylinders, National Fire Protection Association*

Occupational Safety and Health Administration: *29 CFR 1910.37, 29 CFR 1910.101, 29 CFR 1910.103,*