MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

1. PRODUCT AND COMPANY INFORMATION

CHEMICAL NAME; CLASS: NON-FLAMMABLE GAS MIXTURE

Containing Hydrogen (< 4.1%) and Air (Balance)

SYNONYMS: Not Applicable
CHEMICAL FAMILY: Not Applicable
FORMULA: Not Applicable

	Document Number: 30021
PRODUCT USE:	For general analytical/synthetic chemical uses.
MANUFACTURED/SUPPLIED FOR:	
ADDRESS:	2700 Post Oak Drive Houston, TX 77056-8229
EMERGENCY PHONE:	CHEMTREC: 1-800-424-9300
BUSINESS PHONE:	
General MSDS Information	1-713/896-2896
Fax on Demand:	1-800/231-1366

2. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This is a colorless, odorless, non-flammable gas mixture. The main health hazards associated with releases of this gas are related to the high pressure. This gas mixture is generally considered non-flammable, however, this gas mixture will support combustion. A cylinder rupture hazard exists when this gas mixture, which is under pressure, is subject to heat or flames.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this gas mixture is by inhalation.

INHALATION: This gas mixture is non-toxic and has the oxygen content necessary to support life.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to this gas mixture may cause the following health effects.

ACUTE: The most significant hazard associated with gas mixture is the pressure hazard.

CHRONIC: There are currently no known adverse health effects associated with chronic exposure to this gas mixture.

TARGET ORGANS: Not applicable.

3. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	OTHER
Hydrogen	1333-74-0	< 4.1%	There are no specific exposure limits for Hydrogen. Hydrogen is a simple asphyxiant (SA).					
Air (compressed, atmospheric)	132259-10-0	Balance	The composition of Air is as follows: 79% Nitrogen and 21% Oxygen. Where applicable, these components and their concentrations have been incorporated into this MSDS.					
Air is a mixture of gases. The primary components of air, and the approximate concentration of each component, are listed below.								
Oxygen	7782-44-7	21%	There are no specific exposure limits for Oxygen.					
Nitrogen	7727-37-9	Balance	There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					

This material is classified as hazardous under OSHA regulations in the United States and the WHMIS in Canada.

NE = Not Established. C = Ceiling Limit. See Section 16 for Definitions of Terms Used.

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-2004 format.

4 FIRST-AID MEASURES

The opportunity for injury from this gas mixture is limited to over-pressure accidents, which can occur after the rapid release of the gas from the cylinder. In the event of such accidents, seek immediate and qualified medical attention.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): Not applicable.
Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS: Non-flammable. Use extinguishing media appropriate for surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This gas mixture will not burn; however, it will support combustion of flammable materials. Cylinders, when involved in a fire, may rupture or burst in the heat of the fire.

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. If possible, shut off the flow of this gas mixture supporting the fire. Immediately cool the cylinders with water spray from a maximum distance. When cool, move cylinders from fire area if this can be done without risk to firefighters.

6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a release, clear the affected area, protect people, and respond with trained personnel. Minimum Personal Protective Equipment should be **Level D: safety glasses.** Locate and seal the source of the leaking gas. If this does not stop the release (or if it is not possible to reach the valve), allow the gas to release in-place or remove it to a safe area and allow the gas to be released there. If leaking incidentally from the cylinder or its valve, contact your supplier.

7. HANDLING AND STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: Though this gas mixture contains sufficient oxygen to sustain life, it must be treated as unfit for human consumption and should not be used in applications requiring breathing air.

STORAGE AND HANDLING PRACTICES: Compressed gases can present significant safety hazards. Store cylinders away from heavily trafficked areas and emergency exits. Cylinders should be stored upright (with valve protection cap in place) and firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Cylinders should be stored in dry, well-ventilated areas away from sources of heat, ignition, and direct sunlight. Keep storage area clear of materials that can burn.

Do not allow area where cylinders are stored to exceed 52°C (125°F). Store containers away from heavily trafficked areas and emergency exits. Store away from process and gas production areas, elevators, building and room exits, or main aisles leading to exits. Protect cylinders against physical damage.

Keep the smallest amount on-site as is necessary. Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. Use a check valve in the discharge line to prevent hazardous backflow. Never tamper with pressure relief devices in valves and cylinders.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Compressed gases can present significant safety hazards. The following rules are applicable to work situations in which cylinders are being used:

Before Use: Move cylinders with a suitable hand truck. Do not drag, slide or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap (where provided) in place until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Use piping and equipment adequately designed to withstand pressures to be encountered. Do not heat cylinder by any means to increase the discharge rate of the gas mixture from the cylinder. Do not use oils or grease on gas-handling fittings or equipment. Leak check system with leak detection solution, never with flame. Immediately contact the supplier if there are any difficulties associated with operating cylinder valve. Never insert an object (e.g., wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, casing a leak to occur. Use an adjustable strap wrench to remove overly tight or rusted caps. Never strike an arc on a compressed gas cylinder or make a cylinder part of an electric circuit.

7. HANDLING AND STORAGE (Continued)

After Use: Close main cylinder valve. Valves should be closed tightly. Replace valve protection cap. Mark empty cylinders "EMPTY".

NOTE: Use only DOT or ASME code cylinders designed for compressed gas storage. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Purge gas handling equipment with inert gas before attempting repairs. Always use this gas mixture in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: None needed.

RESPIRATORY PROTECTION: None needed.

EYE PROTECTION: Safety glasses.

HAND PROTECTION: Wear gloves when handling cylinders of this product.

BODY PROTECTION: Use body protection appropriate for task. Safety shoes are recommended when handling cylinders.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for Air, the main component of this gas mixture.

GAS DENSITY @ 21.1°C (70°F) and 1 atm: 0.07493 lb/ ft^3 (1.2 kg/m^3)
BOILING POINT: -194.3°C (-317.8°F)
FREEZING/MELTING POINT @ 10 psig: -216.2°C (-357.2°F)
SOLUBILITY IN WATER, Vol/Vol at 0°C (32°F): 0.0292 **MOLECULAR WEIGHT:** 28.975
SPECIFIC GRAVITY (air = 1) @ 21.1°C (70°F): 1 **pH**: Not applicable.
EVAPORATION RATE (nBuAc = 1): Not applicable. **EXPANSION RATIO**: Not applicable.
VAPOR PRESSURE @ 21.1°C (70°F): Not applicable. **ODOR THRESHOLD**: Not applicable.
SPECIFIC VOLUME (ft^3/lb): Not applicable for Air; 13.8 (for Nitrogen)
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

The following information is for this gas mixture.

APPEARANCE AND COLOR: Colorless, odorless gas mixture.

HOW TO DETECT THIS SUBSTANCE (warning properties): There are no distinct warning properties of this gas mixture. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state.

DECOMPOSITION PRODUCTS: The components of this gas mixture do not decompose, per se, but can react with other compounds in the heat of a fire.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Fuels may form explosive mixtures in air. Hydrogen is incompatible with strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen difluoride, and nitrogen trifluoride).

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology data are available for the components of this gas mixture:

HYDROGEN: There are no specific toxicology data for Hydrogen. Hydrogen is a simple asphyxiant (SA), which acts to displace oxygen in the environment.

SUSPECTED CANCER AGENT: The components of this gas mixture are not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC and therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: Not applicable.

SENSITIZATION TO THE PRODUCT: The components of this gas mixture are not known to cause sensitization after prolonged or repeated exposures.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this gas mixture and its components on the human reproductive system.

Mutagenicity: No mutagenicity effects have been described for this gas mixture.
Embryotoxcity: No embryotoxic effects have been described for this gas mixture.
Teratogenicity: No teratogenicity effects have been described for this gas mixture.
Reproductive Toxicity: No reproductive toxicity effects have been described for gas mixture.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.
reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: A knowledge of the available information suggest that over-exposure to this gas mixture is unlikely to aggravate existing medical conditions.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen, if necessary. Treat symptoms and eliminate exposure.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for the components of this gas mixture.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The components of this gas mixture occur naturally in the atmosphere. The gas will be dissipated rapidly in well-ventilated areas. The following environmental data are applicable to the components of this gas mixture.

NITROGEN: Water Solubility = 2.4 volumes Nitrogen/100 volumes water at 0°C. 1.6 volumes Nitrogen/100 volumes water at 20°C.
OXYGEN: Water Solubility = 1 volume Oxygen/32 volumes water at 20EC. . Log K_{ow} = -0.65.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No adverse effect is anticipated to occur to animals or plant-life, except for frost produced in the presence of rapidly expanding gases.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence of an adverse effect of this gas mixture on aquatic life is currently available.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with any residual gas mixture to Air Liquide. Do not dispose of locally.

For emergency disposal, secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors, away from all sources of ignition.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME:	Compressed gases, n.o.s. (Air, Hydrogen)
HAZARD CLASS NUMBER and DESCRIPTION:	2.2 (Non-Flammable Gas)
UN IDENTIFICATION NUMBER:	UN 1956
PACKING GROUP:	Not applicable.
DOT LABEL(S) REQUIRED:	Non-Flammable Gas

14. TRANSPORTATION INFORMATION (Continued)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 126

MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

U.S. SARA REPORTING REQUIREMENTS: The components of this gas mixture are not subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act.

U.S. SARA THRESHOLD PLANNING QUANTITY: Not applicable.

U.S. CERCLA REPORTABLE QUANTITIES (RQ): Not applicable.

CANADIAN DSL INVENTORY STATUS: The components of this gas mixture are listed on the DSL Inventory.

U.S. TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS:

- No component of this gas mixture is subject to the reporting requirements of CFR 29 1910.1000.
- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).
- Hydrogen is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for each of these gases is 10,000 pounds.
- Nitrogen and Oxygen (the components of Air) are not listed as Regulated Substances, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. Hydrogen is listed under this regulation in Table 3 as a Regulated Substance (Flammable Substance), in quantities of 10,000 lbs (4,553 kg) or greater.
- The regulations of 29 CFR 1910.119 (Process Safety Management of Highly Hazardous Chemicals) are not applicable to this gas mixture.

CALIFORNIA PROPOSITION 65: The components of this gas mixture are not on the California Proposition 65 lists.

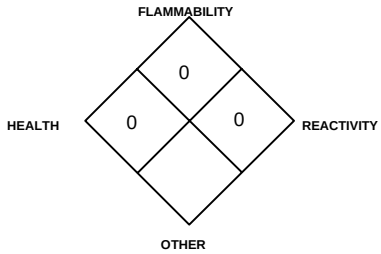
U.S. STATE REGULATORY INFORMATION: The components of this gas mixture are covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: Hydrogen.
California - Permissible Exposure Limits for Chemical Contaminants: Hydrogen.
Florida - Substance List: Hydrogen.
Illinois - Toxic Substance List: Hydrogen.
Kansas - Section 302/313 List: No.
Massachusetts - Substance List: Hydrogen.
Michigan - Critical Materials Register: No.
Minnesota - List of Hazardous Substances: Hydrogen.
Missouri - Employer Information/Toxic Substance List: Hydrogen.
New Jersey - Right to Know Hazardous Substance List: Hydrogen.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: Hydrogen.
Rhode Island - Hazardous Substance List: Hydrogen.
Texas - Hazardous Substance List: No.
West Virginia - Hazardous Substance List: No.
Wisconsin - Toxic and Hazardous Substances: No.

OTHER CANADIAN REGULATIONS: This gas mixture is categorized as a Controlled Product, Hazard Class A, as per the Controlled Product Regulations.

16. OTHER INFORMATION

NFPA RATING



HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH	(BLUE)	0
FLAMMABILITY	(RED)	0
REACTIVITY	(YELLOW)	0
PROTECTIVE EQUIPMENT		B

EYES RESPIRATORY HANDS BODY

See Section 8

For routine industrial applications

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information about gas mixtures can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 4221 Walney Road 5th floor, Chantilly, VA 20151-2923 Telephone: (703) 788-2700

P-1 *"Safe Handling of Compressed Gases in Containers"*
AV-1 *"Safe Handling and Storage of Compressed Gases"*
"Handbook of Compressed Gases"

PREPARED BY:

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AIR LIQUIDE