NorLAB
A DIVISION OF NORCO, INC.

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Hydrogen Sulfide 0.0001% to 2% in Air

MATERIAL SAFETY DATA SHEET

Identification

Product Name: Hydrogen Sulfide 0.0001% to 2% in Air
CAS Number: N/A
Chemical Family: Gas Mixture
Chemical Formula: H^2S in Air
Synonyms: N/A
MSDS Identification Code/Number 2090
Prepared By: Quality Dept.

Revision Date: 02/26/01
Last Review Date: 03/04/13

Composition, Information on Ingredients

Exposure Limits[1]:

INGREDIENT	% VOLUME	PEL-OSHA[2]	TLV-ACGIH[3]	LD_{50} or LC_{50} Route/Species
Hydrogen Sulfide Formula: H_2S CAS: 7783-06-4 RTECS#: MX1225000	≤ 2%	20 ppm ceiling 50 ppm (10-min max. peak)	10 ppm TWA 15 ppm STEL	LC50: 712 ppm Inhalation/rat (1 hr.)
Air Formula: Not Applicable CAS: Not Applicable RTECS#: Not Applicable	98.0 to 99.9999%	Not Applicable	Not Applicable	Not Applicable

[1] Refer to individual state or provincial regulations, as applicable, for limits that may be more stringent than those listed here.
[2] As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993).
[3] As stated in the ACGIH 2007 Threshold Limit Values for Chemical Substances and Physical Agents.

OSHA Regulatory Status: This material is classified as hazardous under OSHA regulations.
IDLH: 100 ppm (H^2S)

Hazards Identification

Emergency Overview:
Colorless gas with characteristic "rotten egg" odor. The odor cannot be relied on as an adequate warning of the presence of Hydrogen Sulfide, because olfactory fatigue occurs. Irritating to the eyes, mucous membranes and respiratory system. Hydrogen sulfide can cause respiratory paralysis, sudden collapse and death. Contents under pressure. Use and store below 125^O F (52^O C).

Route of Entry:

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

Health Effects:

Exposure Limits	Irritant	Sensitization
Yes	Yes	No
Teratogen	Reproductive Hazard	Mutagen
No	No	No
Synergistic Effects None known		

Hazards Identification Continued

Carcinogenicity: NTP: No IARC: No OSHA: No

Eye Effects:
Low concentrations will generally cause irritation to the conjunctiva. Repeated exposure to low concentrations is reported to cause conjunctivitis, photophobia, tears, pain and blurred vision. Contact with rapidly expanding gas near the point of release may cause frostbite.

Skin Effects:
May irritate the skin upon contact. Contact with rapidly expanding gas near the point of release may cause frostbite with redness, skin color change to gray or white, and blistering.

Ingestion Effects:
Ingestion is unlikely. Hydrogen sulfide will irritate the mucous membranes causing a burning feeling with excess salivation likely. Irritation of the gastrointestinal tract may also occur.

Inhalation Effects:
Lethal concentrations of hydrogen sulfide cause respiratory paralysis and breathing stops. Life threatening pulmonary edema is common following prolonged exposure to concentrations between 250 and 600 ppm. Edema has been reported following prolonged exposure at concentrations as low as 50 ppm.

Sense of smell becomes rapidly fatigued and cannot be used as warning of exposure.

Medical Conditions Aggravated by Exposure:
May aggravate pre-existing eye, skin, respiratory and central nervous system (CNS) disorder.

NFPA Hazard Codes		**HMIS Hazard Codes**		**Ratings System**
Health:	1	Health:	1	0 = No Hazard
Flammability:	0	Flammability:	0	1 = Slight hazard
Instability:	0	Physical Hazard:	3	2 = Moderate Hazard
				3 = Serious Hazard
				4 = Severe Hazard

Hazard ratings were assigned in accordance with Compressed Gas Association (CGA) guidelines as published in CGA Pamphlet P-19-2004, *CGA Recommended Hazard Ratings for compressed Gases, 2nd Edition.*

First Aid Measures

Eye:
PERSONS WITH POTENTIAL EXPOSURE TO HYDROGEN SULFIDE SHOULD NOT WEAR CONTACT LENSES. Flush eyes with large amounts of water for at least 15 minutes, holding eyelids open to ensure adequate rinsing. If irritation persists, seek immediate medical attention.

Skin:
Remove contaminated clothing and flush affected area with large quantities of water. If irritation persists or symptoms occur, seek medical attention.

Ingestion:
Not anticipated; product is a gas.

Inhalation:
PROMPT REMOVAL FROM THE CONTAMINATED AREA AND IMMEDIATE MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Rescue personnel should recognize the hazards of overexposure due to olfactory fatigue.

First Aid Measures Continued

Immediately remove to fresh air. If breathing is difficult, administer oxygen. If breathing has stopped, give artificial respiration. Keep victim warm and calm. Further treatment should be symptomatic and supportive. Seek immediate medical attention.

Note to physician: Acute hydrogen sulfide poisoning can be treated by induction of methemoglobinemia through parenteral injection of methemoglobin generating agents (i.e. sodium nitrile). This acts as an antidote by restoring the normal activity of the sulfide inhibited enzyme.

Fire Fighting Measures

Conditions of Flammability: Not flammable		
Flash point: Gas	Method: Not Applicable	Autoignition Temperature: None
LEL (%): Not Applicable	UEL (%): Not Applicable	
Hazardous combustion products: Sulfur dioxide, irritants, toxic gases		
Sensitivity to mechanical shock: No Data		
Sensitivity to static discharge: No Data		

Fire and Explosion Hazards:
The majority of this product is a nonflammable, inert gas. This product does contain 0.0001 – 2% hydrogen sulfide, a flammable component but below its flammable limit. Containers may explode when exposed to heat or flames.

Extinguishing Media:
Use media suitable for surrounding combustible or flammable materials.

Fire Fighting Instructions:
Stop the flow of gas if it can be done without risk. Use water spray to cool surrounding containers. Continue to cool surrounding containers until well after flames are extinguished. Firefighters should wear a full-face piece, NIOSH/MSHA-approved self-contained breathing apparatus (SCBA) operated in positive pressure mode and full turnout gear.

Accidental Release Measures

Isolate hazard area, evacuate personnel and deny entry to unauthorized/unprotected individuals. Extinguish all ignition sources and ventilate closed spaces and low areas. Hydrogen sulfide is soluble, use water spray to knock down vapors and protect personnel. Dike run-off waters for later disposal. Personnel entering area should wear appropriate protective equipment, including respiratory protection suitable for unknown concentrations. Personnel should not re-enter an area until hydrogen sulfide has sufficiently dispersed and adequate oxygen re-established. If a leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container valve, contact the appropriate emergency telephone number listed in Section 1 or call your closest Norco/NorLab location.

Handling and Storage

Electrical classification:
Non-hazardous

Use only in well-ventilated areas. Valve protection caps must remain in place on refillable cylinders unless cylinder is secured with valve 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 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 heavy traffic areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 125^{O} F. Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time.

Handling and Storage Continued

Do not rely on the olfactory sense to detect the presence of hydrogen sulfide. Analytical devices and instrumentation are readily available for this purpose. Perform frequent analytical tests to be certain that the TWA is not exceeded. Many metals corrode rapidly with wet hydrogen sulfide. Anhydrous hydrogen sulfide can be handled in carbon steel, aluminum, Inconel ®, Stelite ®, 304 and 316 stainless steels. Avoid hard steels, which are highly stressed since they may be susceptible to hydrogen embrittlement from hydrogen sulfide. Multipoint air samplers with alarms for plant production units should be provided to constantly monitor the air in and around the units.

For additional recommendations, consult Compressed Gas Association Pamphlets P-1 and G-12.

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.

Exposure Controls, Personal Protection

Engineering Controls:
Use a laboratory hood with forced ventilation for handling small quantities. Use local exhaust to prevent accumulation above the exposure limit.

Eye/Face Protection:
Chemical safety goggles with full face shield.

Skin Protection:
Protective gloves of neoprene, butyl rubber, PVC or polyethylene should be worn.

Respiratory Protection:
A NIOSH/MSHA-approved full-facepiece SCBA operated in positive mode and/or any supplied air respirator with a full-facepiece and operated in a positive pressure mode in combination with an auxiliary self contained breathing apparatus operated in positive pressure mode should be used for high or unknown concentrations. Respirators should be stored in an area not likely to be contaminated.

Other/General Protection:
Safety shoes, safety showers and an emergency eyewash station should be available. Personnel with potential exposure to hydrogen sulfide should work in pairs, wear a gas mask with an all purpose canister or light three minute unit with a self contained air supply for instantaneous use, and carry wet lead acetate paper on wrists or belt for detection of dangerous concentrations of hydrogen sulfide, (turns black in the presence of minute amounts of hydrogen sulfide).

Physical and Chemical Properties

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Gas	
Vapor pressure	: Not available	
Vapor density (Air = 1)	: Not available	
Evaporation point	: Not available	
Boiling point	: Not available	^{o}F ^{o}C
Freezing point	: Not available	^{o}F ^{o}C
pH	: Not applicable	
Specific gravity	: 1.105	
Oil/water partition coefficient	: Not available	
Solubility (H_2O)	: Slightly soluble	
Odor threshold	: Not available	
Odor and appearance	: Colorless gas/vapor. Characteristic hydrogen sulfide – rotten egg odor.	

Stability and Reactivity

Stability:
Stable under normal conditions.

Conditions to Avoid:
Avoid heat, flames, ignition sources, and oxidizing agents.

Incompatible Materials:
Pure hydrogen sulfide is dangerously reactive with fuming or strong nitric acid and strong oxidizers; may ignite on contact with a variety of metal oxides (i.e. copper oxide, nickel oxide, silver (I & II) oxide, sodium peroxide); ignites in contact with fluorine and chlorine monoxide; and forms explosive reactions with oxygen difluoride, nitrogen trifluoride and many halogenic compounds.

Hazardous Decomposition Products:
Oxides of sulfur.

Hazardous Polymerization:
Will not occur.

Toxicological Information

Inhalation:
Inhalation of 1000-3000 ppm (dogs) was lethal. Respiration ceased after several breaths at 3000 ppm and death occurred within 15-20 minutes at concentrations of 1000 ppm.

Skin and Eye:
Concentrations of 50-500 ppm cause eye and respiratory irritation. Ocular toxicity has been reported at hydrogen sulfide concentrations ranging from 5-30 ppm.

Chronic:
Hydrogen sulfide is not considered a cumulative poison; however, headaches, fatigue, dizziness, irritability and loss of libido have been reported following chronic exposure. It is unclear whether low level exposures, repeated unmeasured acute exposures or pre-existing neurological disease are responsible for the above symptoms.

Ecological Information

Environmental Fate:
Hydrogen sulfide does not absorb solar radiation and therefore does not undergo photolysis or photochemical reaction with oxygen. The persistence of hydrogen sulfide in the atmosphere is dependent on season, latitude and atmospheric conditions, ranging from 1 to 40 days with decreased temperatures and decreased levels of hydroxide in northern regions increasing residence time. In soil and water, hydrogen sulfide is oxidized to elemental sulfur by microorganisms via oxidation-reduction reactions, which form part of the global sulfur cycle.

Ecotoxicity:
Data indicates that hydrogen sulfide is toxic to a variety of life forms including both domestic and wild animals, fish, birds, insects and plants.

Disposal Considerations

Do not attempt to dispose of waste or unused quantities in returnable cylinders. Return in the shipping container, *properly labeled, with any valve outlet plugs or caps secure and valve protection cap in place* to NorLab for proper disposal. Non-refillable containers should be vented in a well-ventilated area then disposed of in compliance with local regulations, or returned to NorLab.

Transportation Information

Parameter	United States DOT	Canada TDG
Proper Shipping Name:	Compressed gas, N. O. S., (Hydrogen Sulfide, Air)	Compressed gas, N. O. S.,
Hazard Class:	2.2	2.2
Identification Number:	UN 1956	UN 1956
Shipping Label:	Non Flammable Gas	Non Flammable Gas

Regulatory Information

Hydrogen sulfide is listed under the accident prevention provisions of section 112 (r) of the Clean Air Act (CAA) with a threshold quantity (TQ) of 10,000 pounds.

SARA Title III Notifications and Information:
Hydrogen sulfide is listed as an extremely hazardous substance (EHS) subject to state and local reporting under Section 304 of SARA Title III (EPCRA). The presence of hydrogen sulfide in quantities in excess of the threshold planning quantity (TPQ) of 500 pounds requires certain emergency planning activities to be conducted.

Releases of hydrogen sulfide in quantities equal to or greater than the reportable quantity (RQ) of 100 pounds are subject to reporting to the national Response Center under CERCLA, Section 304 SARA Title III.

SARA Title III – Hazard Classes:
Acute health Hazard
Sudden Release of Pressure Hazard

SARA Title III – Section 313 Supplier Notification:
This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

CAS Number	Ingredient Name	Percent by Volume
7783-06-4	Hydrogen sulfide	≤2%

This information must be included on all MSDSs that are copied and distributed for this material.

California Proposition 65: This product does not contain ingredient(s) known to the State of California to cause cancer or reproductive toxicity.

Other Information

Compressed gas cylinders must 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/her (written) consent is a violation of transportation regulations.

Disclaimer of expressed and implied warranties:
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