

MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT IDENTIFICATION

PRODUCT NAME: Hydrogen Sulfide
CHEMICAL NAME: Sulfides **FORMULA:**
H₂S
SYNONYMS: Sulfuretted Hydrogen; Hydrogen Sulphide;
Hydrosulfuric Acid; Sulfur Hydride; Sewer Gas; Sour Gas

MANUFACTURER: Air Products and Chemicals, Inc.
ADDRESS: 7201 Hamilton Boulevard
Allentown, PA 18195-1501

PRODUCT INFORMATION: (800) 752-1597

MSDS NUMBER: 1010 **REVISION:** 5
REVIEW DATE: October 1998 **REVISION DATE:** October 1998

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

Hydrogen Sulfide is sold as pure product (> 99%).

CAS NUMBER: 7783-06-4

EXPOSURE LIMITS:

OSHA: PEL = 20 ppm (Ceiling) **ACGIH:** TWA = 10 ppm
(10 minutes)

NIOSH: REL = 10 ppm Ceiling

STEL = 15 ppm

IDLH = 100 ppm

SECTION 3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW

Hydrogen Sulfide is a toxic, flammable, colorless, liquefied gas. Hydrogen Sulfide has a distinct "rotten-egg" smell. The odor cannot be relied on as an adequate warning of the presence of Hydrogen Sulfide because at high concentrations olfactory fatigue occurs. Inhalation of high concentrations of this gas can result in unconsciousness, coma, and death. Direct contact with liquid Hydrogen Sulfide can cause frostbite. Hydrogen Sulfide poses an immediate fire hazard when mixed with air. The gas is heavier than air, and may spread long distances. Distant ignition and flashback are possible. Flame or high temperature impinging on a localized area of a cylinder of Hydrogen Sulfide can cause the cylinder to explode without activating the cylinder's relief devices. Provide adequate fire protection during emergency response situations. Contact with the liquid (or, contact with rapidly expanding gases) may cause frostbite.

EMERGENCY TELEPHONE NUMBERS

(800) 523-9374
(610) 481-7711

Continental U.S., Canada, and Puerto Rico
Other locations

ACUTE POTENTIAL HEALTH EFFECTS:

ROUTES OF EXPOSURE:

EYE CONTACT: Inflammation and irritation of the eyes can occur at very low airborne concentration (less than 10 ppm). Exposure over several hours may result in "gas eyes" or "sore eyes" with symptoms of scratchiness, irritation, tearing and burning. Above 50 ppm, there is an intense tearing, blurring of vision, and pain when looking at light. Exposed individuals may see rings around bright lights. Most symptoms disappear when exposure ceases. However, in serious cases, the eye can be permanently damaged. In addition to irritation, contact of the eyes with the liquid can cause frostbite.

INGESTION: Ingestion of Hydrogen Sulfide is not a likely route of industrial exposure.

INHALATION: Inhalation of high concentrations of Hydrogen Sulfide can cause dizziness, headache, and nausea. Exposure to higher concentrations can result in respiratory arrest, coma, or unconsciousness. Exposure for more than 30 minutes at concentrations of greater than 600 ppm have been fatal. Continuous inhalation of low concentrations may cause olfactory fatigue, so that the odor is no longer an effective warning of the presence of Hydrogen Sulfide. Severe exposures which do not result in death may cause long-term symptoms such as memory loss, paralysis of facial muscles, or nerve tissue damage.

SKIN CONTACT: The gas may be irritating to the skin. Direct contact with liquid or rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after contact with liquid can quickly subside.

POTENTIAL HEALTH EFFECTS OF REPEATED EXPOSURE:

ROUTE OF ENTRY: Inhalation, skin contact

TARGET ORGANS: Respiratory system, skin, central nervous system.

SYMPTOMS: The most significant symptoms of chronic, low level exposure are related to the central nervous system, with potential nerve tissue damage. Repeated low level skin exposure may cause dermatitis.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: Acute or chronic respiratory conditions or eye disorders may be aggravated by over-exposure to Hydrogen Sulfide.

CARCINOGENICITY: Hydrogen Sulfide is not found on the FEDERAL OSHA Z LIST, NTP, CAL/OSHA, or IARC Carcinogenicity lists.

SECTION 4. FIRST AID MEASURES

EYE CONTACT: If liquid is splashed into eyes, or if irritation of the eye develops after exposure to Hydrogen Sulfide, open victim's eyes while under gentle, lukewarm, running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention from an ophthalmologist.

INGESTION: Ingestion is an unlikely route of exposure for Hydrogen Sulfide.

INHALATION: Remove victim(s) to fresh air, as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary.

SKIN CONTACT: If liquid is spilled on skin, or if irritation of the skin develops after exposure to liquid or gas, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention. In case of frostbite, place the frostbitten part in warm water. **DO NOT USE HOT WATER.** If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area in the armpit. Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention.

NOTES TO PHYSICIANS: Administer oxygen, if necessary and treat symptoms. Be observant for initial signs of pulmonary edema.

SECTION 5. FIRE FIGHTING MEASURES

FLASH POINT:
Flammable gas

AUTOIGNITION:
500 °F (260 °C)

FLAMMABLE RANGE:
(LEL): 4.0% (UEL): 44.0%

EXTINGUISHING MEDIA: Extinguish Hydrogen Sulfide fires by shutting-off the source of the gas. Use water spray to cool fire-exposed containers, structures, and equipment. Other appropriate extinguishing media are dry chemical, foam, and carbon dioxide.

SPECIAL FIRE-FIGHTING PROCEDURES: Evacuate all personnel from area. If possible without risk, shut off source of gas, then fight fire according to types of materials burning. Extinguish fire only if gas flow can be stopped. This will avoid possible accumulation and reignition of a flammable gas mixture. Keep adjacent cylinders cool by spraying with large amounts of water until the fire burns itself out. For small releases, if it is not possible to stop the leak, and it does not endanger personnel, let the fire burn itself out. Incipient fire responders should wear eye protection. Structural fire fighters must wear Self-Contained Breathing

Apparatus and full protective equipment, including fire resistant clothing. Large fires should be fought from a distance with an unmanned hose holder or monitor nozzles. If this product is involved in a fire, fire run-off water should be contained to prevent possible environmental damage. If necessary, decontaminate fire-response equipment with soap and water solution.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Most cylinders are designed to vent contents when exposed to elevated temperatures. Pressure in a cylinder can build-up due to heat and it may rupture if pressure relief devices should fail to function. An extreme explosion hazard exists in areas in which the gas has been released but the material has not yet ignited.

HAZARDOUS COMBUSTION PRODUCTS: Oxides of sulfur

SECTION 6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Evacuate immediate area. Eliminate any possible sources of ignition, and provide maximum explosion-proof ventilation. Shut off source of leak, if possible. Isolate any leaking cylinder. If leak is from container, pressure relief device or its valve, contact your supplier. If leak is in user's system, close cylinder valve, safely vent pressure and purge with inert gas before attempting repairs. Protection of all personnel and the area must be maintained. All responders must be adequately protected from exposure. Monitoring should be done for the levels of Hydrogen Sulfide. Colorimetric tubes are available to detect the presence of Hydrogen Sulfide. Levels of Hydrogen Sulfide should be below levels listed in Section 2 (Composition / Information on Ingredients) and the atmosphere must have at least 19.5% oxygen before personnel can be allowed in the area without Self-contained breathing apparatus. Combustible vapor levels must be below 0.4%, which is 10% of the LEL of Hydrogen Sulfide, prior to entry.

SECTION 7. HANDLING AND STORAGE

STORAGE: Store cylinders in a well-ventilated, secure area, protected from the weather. Cylinders should be stored up-right with valve outlet seals and valve protection caps in place. Storage should be away from heavily traveled areas and emergency exits. There should be no sources of ignition. All electrical equipment should be explosion-proof in the storage areas. Storage areas must meet National Electrical Codes for Class 1 hazardous areas. Flammable storage areas should be separated from oxygen and other oxidizers by a minimum distance of 20 ft. or by a barrier of non-combustible material at least 5 ft. high, having a fire resistance rating of at least 1/2 hour. Post "No Smoking or Open Flames" signs in the storage and use areas. Do not allow storage temperature to exceed 125 °F (52 °C). 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. Consideration should be taken to install leak detection and alarm equipment for storage areas.

HANDLING: Do not drag, roll, slide or drop cylinder. Use a suitable hand truck designed for cylinder movement. Never attempt to lift a cylinder by its cap. Secure cylinders at all times while in use. Use a pressure reducing regulator to safely discharge product from cylinder. Use a check valve to prevent reverse flow into cylinder. Never apply flame or localized heat directly to any part of the cylinder. Once cylinder has been connected to properly purged and inerted process, open cylinder valve slowly and carefully. If user experiences any difficulty operating cylinder valve, discontinue use and contact supplier. Never insert an object (e.g., wrench, screwdriver, etc.) into valve cap openings. Doing so may damage valve, causing a leak to occur. Use an adjustable strap-wrench to remove over-tight or rusted caps. All piped systems and associated equipment must be grounded. Electrical equipment should be non-sparking or explosion-proof.

SPECIAL PRECAUTIONS: Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of Hydrogen Sulfide could occur without any significant warning symptoms. All work operations should be monitored in such a way that emergency personnel can be immediately contacted in the event of a release. All work practices should minimize the release of Hydrogen Sulfide.

Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, Inc. (telephone 703-412-0900) pamphlet CGA P-1, *Safe Handling of Compressed Gases in Containers*. Local regulations may require specific equipment for storage and use.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS:

VENTILATION: Hydrogen Sulfide detectors should be installed in or near areas where Hydrogen Sulfide is being used or stored. If appropriate, install automatic monitoring equipment to detect the level of oxygen and the presence of potentially explosive air-gas mixtures. Because of the high hazard associated with Hydrogen Sulfide, stringent control measures such as a gas cabinet enclosure or isolation may be necessary. Provide natural or explosion-proof ventilation adequate to ensure Hydrogen Sulfide does not reach exposure limits listed in Section 2. (Composition / Information on Ingredients). Local exhaust ventilation is preferred, because it prevents gas dispersion into the work place by eliminating it at its source.

RESPIRATORY PROTECTION: Maintain exposure levels of Hydrogen Sulfide below the levels listed in Section 2 (Composition / Information on Ingredients). Use supplied air respiratory protection if Hydrogen Sulfide levels exceed exposure limits or during emergency response to a release of this product. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent State standards. The following NIOSH respiratory protection recommendations are for Hydrogen Sulfide. Up to 100 ppm - Powered air-purifying respirator with cartridge(s) to protect against hydrogen sulfide; or gas mask with canister to protect against hydrogen sulfide; or SAR; or full-facepiece SCBA.

Emergency Use: Emergency or Planned Entry into Unknown Concentration or IDLH Conditions: Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA. Gas mask with canister to protect against hydrogen sulfide; or escape-type SCBA. The IDLH concentration for Hydrogen Sulfide is 100 ppm. High concentrations may be within the flammable range and must not be entered.

EYE PROTECTION: Safety glasses. Additionally, face-shields should be worn if there is a potential for contact with liquid Hydrogen Sulfide. Eye wash stations/safety showers should be near areas where Hydrogen Sulfide is used or stored.

SKIN PROTECTION: Work gloves are recommended when handling cylinders of Hydrogen Sulfide. Use thermally insulated gloves when working with containers of Liquid Hydrogen Sulfide. Wear chemically-resistant gloves when using this gas. Butyl rubber, chlorinated polyethylene, neoprene nitrile, and polyvinyl rubber are recommended. Use fire-resistant gloves and clothing in emergency situations. Use double gloves for spill response.

OTHER PROTECTIVE EQUIPMENT: Use body protection appropriate for task. Static-resistant clothing is recommended. Safety shoes are recommended when handling cylinders. Transfer of large quantities under pressure may require use of fire retardant and/or chemically impervious clothing.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE, ODOR AND STATE: Colorless gas. The liquid is also colorless. The odor for both the liquid and gas is similar to that of "rotten eggs".

MOLECULAR WEIGHT: 34.08

BOILING POINT (1 atm): -76.4 °F (-60.2 °C)

SPECIFIC GRAVITY (also called vapor density) (air = 1): 1.189

SPECIFIC GRAVITY (of liquid) (At 59 °F (15 °C)): 0.79

FREEZING/MELTING POINT: -117.2 °F (-82.9 °C)

VAPOR PRESSURE (At 70 °F (21.1°C)): 248.9 psig

GAS DENSITY (At 68 °F (20 °C) and 1 atm): 0.088 lb/ft³

SOLUBILITY IN WATER (At 68 °F (20 °C)): 0.317 lb/gal

SECTION 10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable

CONDITIONS TO AVOID: Cylinders should not be exposed to temperatures in excess of 125 °F (52 °C).

INCOMPATIBILITY (Materials to Avoid): Hydrogen Sulfide is a strong reducing agent and is highly reactive. Hydrogen Sulfide is not compatible with the following materials: oxidizing agents, organic peroxides, alkaline materials, metals (i.e. copper, lead), and metal oxides. Hydrogen Sulfide is corrosive to most metals, because it reacts with these substances to form metal sulfides.

REACTIVITY:**A) HAZARDOUS DECOMPOSITION PRODUCTS:** Hydrogen and sulfur**B) HAZARDOUS POLYMERIZATION:** Will not occur**SECTION 11. TOXICOLOGICAL INFORMATION**

LC₅₀, TCLO, or LCLo (Inhalation): Human LCLo: 600 ppm/30 minutes; Man LDLo: 5700 mg/kg (Central Nervous System Effects, Pulmonary System Effects); Human LCLo: 800 ppm/5 minutes; Rat LC₅₀: 444 ppm; Rat TCLO: 20 ppm (female 6-22 days post) (Reproductive Effects); Mammal LCLo: 800 ppm/5 minutes; Rat TCLO: 1200 mg/m³/2 hours/5 days-intermittent (Brain and Coverings-other degenerative changes; Biochemical - enzyme inhibition, induction, or change in blood or tissue levels - true cholinesterase); Rat TCLO: 100 ppm/8 hours/5 weeks-intermittent (Brain and Coverings - other degenerative changes; Lungs, Thorax, or Respiration - other changes; Biochemical - enzyme inhibition, induction, or change in blood or tissue levels - cytochrome oxidases (including oxidative phosphorylation)); Rat TCLO: 80 ppm/6 hours/90 days-intermittent (Brain and Coverings - changes in brain weight; Nutritional and Gross Metabolic - weight loss or decreased weight gain); Rat TCLO: 80 ppm/6 hours/90 days-intermittent (Nutritional and Gross Metabolic - weight loss or decreased weight gain; Related to Chronic Data - death); Mouse LC₅₀: 634 ppm/1 hour; Rabbit TCLO: 40 mg/m³/5 hours/30 weeks-intermittent (Sense Organs and Special Senses (Eye) - conjunctive irritation); Rat TCLO: 20 ppm: female 6-22 day(s) after conception; lactating female 21 day(s) post-birth (Reproductive - Effects on Newborn - physical).

LD₅₀, (Oral): No data currently available.**LD₅₀ (Dermal):** No data currently available.**SKIN CORROSIVITY:** Hydrogen Sulfide is irritating to the skin.**CARCINOGENICITY:** Currently, Hydrogen Sulfide has not been found to be carcinogenic.**ADDITIONAL NOTES:** None**SECTION 12. ECOLOGICAL INFORMATION**

AQUATIC TOXICITY: Currently, the following aquatic toxicity data are available for Hydrogen Sulfide:

TLm (Asellussp) 96 hours = 0.111 mg/L

TLm (Cranfngonyx sp) 96 hours = 1.07 mg/L

TLm (Gammarrus) 96 hours = 0.84 mg/L

LC₅₀ (fly inhalation) 960 minutes = 380 mg/m³LC₅₀ (fly inhalation) 7 minutes = 1500 mg/m³

TLm (Lepomis macrochirus, bluegill sunfish) 96 hours = 0.0478 mg/L

TLm (*Lepomis macrochirus*, bluegill sunfish) 96 hours = 0.0448 mg/L at 21-22 °CTLm (*Pimephales promelas*, fathead minnow) 96 hours = 0.0071-0.55 mg/LTLm (*Salvelinus fontinalis*, brook trout) 96 hours = 0.0216-0.038 mg/L at 8-12.5 °C**MOBILITY:** Hydrogen Sulfide will not be mobile in soil.

PERSISTENCE AND BIODEGRADABILITY: Persistence: Converts to elemental sulfur upon standing in water. Biodegradation: Microorganisms in soil and water are involved in oxidation-reduction reactions that oxidize hydrogen sulfide to elemental sulfur. Members of the genera Beggiatoa, Thioploca, and Thiotrix function in transition zones between aerobic and anaerobic conditions where both molecular oxygen and hydrogen sulfide are found. Also, some photosynthetic bacteria oxidize hydrogen sulfide to elemental sulfur. Members of the families Chlorobiaceae and Chromatiaceae (purple sulfur bacteria) are obligate aerobes and are phototropic, and are found in waters with high H₂S concentrations. The interactions of these organisms form part of the global sulfur cycle.

POTENTIAL TO BIOACCUMULATE: Hydrogen Sulfide does not have bioaccumulation or food chain contamination potential.

REMARKS: Hydrogen Sulfide is not a Class I or Class II ozone depleting chemical (40 CFR Part 82).

SECTION 13. DISPOSAL CONSIDERATIONS

UNUSED PRODUCT / EMPTY CONTAINER: Return container and unused product to supplier. Do not attempt to dispose of residual or unused quantities.

DISPOSAL INFORMATION: Shall be done in accordance with Federal, State and local regulations. Wastes containing this material may be classified by EPA as a hazardous waste by characteristic (such as Ignitability, Corrosivity, Toxicity, Reactivity). Waste streams must be characterized by the user to meet Federal, State and local requirements.

SECTION 14. TRANSPORT INFORMATION

DOT PROPER SHIPPING NAME: Hydrogen Sulfide, liquefied
HAZARD CLASS NUMBER and DESCRIPTION: 2.3 (Poison Gas)
UN IDENTIFICATION NUMBER: UN1053
DOT SHIPPING LABEL(S) REQUIRED: Poison Gas, Flammable Gas
PLACARD (When required): Poison Gas
SPECIAL SHIPPING INFORMATION: Hydrogen Sulfide is poisonous by inhalation. Shipments must be properly described as inhalation hazards. ZONE B. Cylinders should be transported in a secure upright position in a well-ventilated truck. Never transport in passenger compartment of a vehicle. Ensure cylinder valve is properly closed, valve outlet cap has been reinstalled, and valve protection cap is secured before shipping cylinder.
CAUTION: Compressed gas cylinders shall not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with the owner's written consent is a violation of Federal law (49 CFR 173.301).
NAERG (NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK) #: 117

SECTION 15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

EPA - ENVIRONMENTAL PROTECTION AGENCY:

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1990 (40 CFR Parts 117 and 302)

Reportable Quantity (RQ): 100 lbs (455 kg)

SARA TITLE III: Superfund Amendment and Reauthorization Act

SECTIONS 302/304: Emergency Planning and Notification (40 CFR Part 355)

Extremely Hazardous Substances: Hydrogen Sulfide is listed.

Threshold Planning Quantity (TPQ): 500 lbs (2275 kg)

Reportable Quantity (RQ): 100 lbs (455 kg)

SECTIONS 311/312: Hazardous Chemical Reporting (40 CFR Part 370)

IMMEDIATE HEALTH: Yes

PRESSURE: Yes

DELAYED HEALTH: No

REACTIVITY: No

FIRE: Yes

SECTION 313: Toxic Chemical Release Reporting (40 CFR 372)

Releases of Hydrogen Sulfide require reporting under Section 313.

CLEAN AIR ACT:

SECTION 112 (r): Risk Management Programs for Chemical Accidental Release (40 CFR Part 68)

Hydrogen Sulfide is listed as a regulated substance.

Threshold Planning Quantity (TPQ): 10,000 lbs (4,553 kg)

TSCA: Toxic Substances Control Act

Hydrogen Sulfide is listed on the TSCA Inventory.

OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:

29 CFR Part 1910.119: Process Safety Management of Highly Hazardous Chemicals.

Hydrogen Sulfide is listed in Appendix A of this regulation as a highly hazardous substance.

Threshold Planning Quantity (TPQ): 1500 lbs (682 kg)

STATE REGULATIONS:

CALIFORNIA:

Proposition 65: Hydrogen Sulfide is not a listed substance which the State of California requires warning under this statute.

SECTION 16. OTHER INFORMATION

NFPA RATINGS:

HEALTH: = 4

FLAMMABILITY: = 4

REACTIVITY: = 0

SPECIAL: None

HMIS RATINGS:

HEALTH: = 4

FLAMMABILITY: = 4

REACTIVITY: = 0