Chemical Profiles

Hydrogen Sulfide

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What are other names or identifying information for hydrogen sulfide?

CAS Registry No.: 7783-06-4
Other Names: H2S, hydrogen sulphide, sour gas, sewer gas
Main Uses: Manufacture of other chemicals; manufacturing processes; environmental contaminant; by-product of industrial processes.
Appearance: Colourless gas.
Odour: Rotten eggs. Sickening sweet odour at high concentrations. Can dull the sense of smell.

Canadian TDG: UN1053

What is the WHMIS classification?

According to the Commission des normes, de l'équité, de la santé et de la sécurité du travail (CNESST), hydrogen sulfide can be classified as:

Flammable gases - Category 1

Gases under pressure - Liquefied gas

Acute toxicity - inhalation - Category 2

Serious eye damage/eye irritation - Category 2

Specific target organ toxicity - single exposure (respiratory tract irritation) - Category 3 - Respiratory tract irritation

The signal word is danger.

The hazard statements are:

- Extremely flammable gas
- Contains gas under pressure; may explode if heated
- Fatal if inhaled
- Causes serious eye irritation
- May cause respiratory irritation

Please note that this classification was retrieved from the CNESST site on February 22, 2023 and was established by CNESST personnel to the best of their knowledge based on data obtained from scientific literature and it incorporates the criteria contained in the Hazardous Products Regulations (SOR/2015-17). It does not replace the supplier's classification which can be found on its Safety Data Sheet.

What are the most important things to know about hydrogen sulfide in an emergency?

Emergency Overview: Colourless gas. Rotten eggs odour. COMPRESSED GAS. Contains gas under pressure. May explode if heated. EXTREMELY FLAMMABLE GAS. Distant ignition and flashback are possible. CONFINED SPACE HAZARD. Can accumulate in hazardous amounts in low-lying areas especially inside confined spaces. VERY TOXIC. Fatal if inhaled. May cause respiratory irritation. IRRITANT. Causes moderate or severe eye irritation. May cause frostbite.

What are the potential health effects of hydrogen sulfide?

Main Routes of Exposure: Inhalation; eye contact.

- **Inhalation:** VERY TOXIC, can cause death. Can cause severe irritation of the nose and throat. Can cause life-threatening accumulation of fluid in the lungs (pulmonary edema). Can cause, excitement, headache, dizziness, staggering, sudden collapse ("knockdown"), unconsciousness, and death Long-term damage may result from a severe short-term exposure. Can harm the nervous system. Can cause lung injury. A single exposure to a high concentration can cause a long-lasting condition like asthma. If this occurs, many things like other chemicals or cold temperatures can easily irritate the airways. Symptoms may include shortness of breath, tightness in the chest and wheezing. [Reactive Airways Dysfunction Syndrome (RADS)].
- **Skin Contact:** Direct contact with the liquefied gas can chill or freeze the skin (frostbite). Symptoms of mild frostbite include numbness, prickling and itching. Symptoms of more severe frostbite include a burning sensation and stiffness. The skin may become waxy white or yellow. Blistering, tissue death and infection may develop in severe cases.
- **Eye Contact:** EYE IRRITANT. The gas irritates the eyes. Direct contact with the liquefied gas can freeze the eye. Permanent eye damage or blindness can result.
- **Ingestion:** Not a relevant route of exposure (gas).

- **Effects of Long-Term (Chronic) Exposure:** Conclusions cannot be drawn from the limited studies available. May harm the nervous system. Symptoms may include restlessness, reduced ability to think, muscle tremors, memory loss and personality changes. May harm the respiratory system.
- **Carcinogenicity:** Not known to cause cancer.
    - International Agency for Research on Cancer (IARC): Not specifically evaluated.
    - American Conference for Governmental Industrial Hygienists (ACGIH): Not specifically designated.

- **Teratogenicity / Embryotoxicity:** Not known to harm the unborn child. Conclusions cannot be drawn from the limited studies available.
- **Reproductive Toxicity:** Not known to be a reproductive hazard.
- **Mutagenicity:** Not known to be a mutagen.

What are first aid measures for hydrogen sulfide?

Inhalation: Take precautions to prevent a fire (e.g. remove sources of ignition). Take precautions to ensure your own safety before attempting rescue (e.g. wear appropriate protective equipment). Move victim to fresh air. Keep at rest in a position comfortable for breathing. If breathing is difficult, trained personnel should administer emergency oxygen. DO NOT allow the victim to move about unnecessarily. Symptoms of pulmonary edema may be delayed. If breathing has stopped, trained personnel should begin artificial respiration (AR). If the heart has stopped, trained personnel should start cardiopulmonary resuscitation (CPR) or automated external defibrillation (AED). Avoid mouth-to-mouth contact by using mouth guards or shields. Get medical attention immediately. Treatment is urgently required. Transport to a hospital. NOTE: Victims may pose a threat to responders due to the release of hydrogen sulfide from their clothing, skin, and exhaled air.

Skin Contact: Liquefied gas: quickly remove the victim from the source of contamination. DO NOT attempt to rewarm the affected area on site. DO NOT rub area, flush with water, or apply direct heat. Carefully cut around clothing that sticks to the skin and remove the rest of the garment. DO NOT remove frozen clothing from frostbitten areas. Loosely cover the affected area with a sterile dressing. DO NOT allow victim to drink alcohol or smoke. Get medical attention immediately. Treatment is urgently required. Transport to a hospital. Double bag, seal, label and leave contaminated clothing, shoes and leather goods at the scene for safe disposal.

Eye Contact: Gas: immediately flush the contaminated eye(s) with gently flowing water for at least 20 minutes, occasionally lifting the upper and lower eyelids. Liquefied gas: immediately and briefly flush with gently flowing water. DO NOT attempt to rewarm. Cover both eyes with a sterile dressing. DO NOT allow victim to drink alcohol or smoke. Get medical attention immediately. Treatment is urgently required. Transport to a hospital.

Ingestion: Not applicable (gas).

First Aid Comments: Some of the first aid procedures recommended here require advanced first aid training. All first aid procedures should be periodically reviewed by a medical professional familiar with the chemical and its conditions of use in the workplace.

What are fire hazards and extinguishing media for hydrogen sulfide?

Flammable Properties: EXTREMELY FLAMMABLE GAS. Can easily ignite. Can readily form explosive mixture with air at room temperature.

Suitable Extinguishing Media: Carbon dioxide, dry chemical powder, water spray or fog.

Specific Hazards Arising from the Chemical: Gas may travel a considerable distance to a source of ignition and flash back to a leak or open container. Gas may accumulate in hazardous amounts in low-lying areas especially inside confined spaces, resulting in a health hazard. Heat from fire can cause a rapid build-up of pressure inside cylinders. Explosive rupture and a sudden release of large amounts of gas may result. Cylinder may rocket. In a fire, the following hazardous materials may be generated: corrosive sulfur oxides.

What are the stability and reactivity hazards of hydrogen sulfide?

- **Chemical Stability:** Normally stable.
- **Conditions to Avoid:** Open flames, sparks, static discharge, heat and other ignition sources.
- **Incompatible Materials:** Highly reactive. Increased risk of fire and explosion on contact with: metal oxides (e.g., copper oxide), oxidizing agents (e.g., peroxides), strong bases (e.g., sodium hydroxide). In the presence of water, corrosive to: carbon steel. Not corrosive to: aluminum alloys.
- **Hazardous Decomposition Products:** None known.
- **Possibility of Hazardous Reactions:** None known.

What are unintentional release measures for hydrogen sulfide?

Personal Precautions: Evacuate the area immediately. Isolate the hazard area. Keep out unnecessary and unprotected personnel. Evacuate downwind locations. Do not touch damaged containers or spilled product unless wearing appropriate protective equipment. Ventilate area. Eliminate all ignition sources. Use grounded, explosion-proof equipment. Distant ignition and flashback are possible.

Methods for Containment and Clean-up: Liquid: stop or reduce leak if safe to do so. If not, allow liquid to vapourize. Ventilate the area to prevent the gas from accumulating, especially in confined spaces. Gas: stop or reduce leak if safe to do so. Ventilate the area to prevent the gas from accumulating, especially in confined spaces.

What handling and storage practices should be used when working with hydrogen sulfide?

Handling: Before handling, it is important that all engineering controls are operating and that protective equipment requirements and personal hygiene measures are being followed. Only trained personnel should work with this product. Do NOT work alone with this product. In event of a spill or leak, immediately put on escape-type respirator and exit the area. Use non-sparking ventilation systems, approved explosion-proof equipment and intrinsically safe electrical systems. Electrically bond and ground equipment. Ground clips must contact bare metal. Eliminate heat and ignition sources such as sparks, open flames, hot surfaces and static discharge. Post "No Smoking" signs. Prevent unintentional contact with incompatible chemicals. Use the pressure regulator appropriate for cylinder pressure and contents. Secure cylinder in an up-right position. Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop.

Storage: Store in an area that is: cool, dry, temperature-controlled, well-ventilated, out of direct sunlight and away from heat and ignition sources, separate from incompatible materials, an approved, fire-resistant area, clear of combustible and flammable materials (e.g. old rags, cardboard), on the ground floor or preferably, in an isolated, detached building. Electrically bond and ground containers. Ground clips must contact bare metal. Avoid bulk storage indoors. Empty containers may contain hazardous residue. Store separately. Keep closed.

What is the American Conference of Governmental Industrial Hygienists (ACGIH®) recommended exposure limit for hydrogen sulfide?

ACGIH® TLV® - TWA: 1 ppm

ACGIH® TLV® - STEL [C]: 5 ppm

Exposure Guideline Comments: TLV® = Threshold Limit Value. TWA = Time-Weighted Average. STEL = Short-term Exposure Limit. C = Ceiling limit.

Adapted from: 2022 TLVs® and BEIs® - Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati: American Conference of Governmental Industrial Hygienists (ACGIH)

NOTE: In many (but not all) Canadian jurisdictions, the exposure limits are similar to the ACGIH® TLVs®. Since legislation varies by jurisdiction, contact your local jurisdiction for exact details. A list is available in the OSH Answers on Canadian Governmental Occupational Health & Safety Departments.

A list of which acts and regulations that cover exposure limits to chemical and biological agents is available on our website. Please note that while you can see the list of legislation for free, you will need a subscription to view the actual documentation.

What are the engineering controls for hydrogen sulfide?

Engineering Controls: Use a local exhaust ventilation and enclosure, if necessary, to control amount in the air. It may be necessary to use stringent control measures such as process enclosure to prevent product release into the workplace. Use non-sparking ventilation systems, approved explosion-proof equipment and intrinsically safe electrical systems in areas where this product is used and stored. Use a ventilation system separate from other exhaust ventilation systems. Filter the contaminated air before it is directly exhausted to the outside. Use leak and fire detection equipment and an automatic fire suppression system.

What Personal Protective Equipment (PPE) is needed when working with hydrogen sulfide?

Eye/Face Protection: Wear chemical safety goggles. A face shield (with safety goggles) may also be necessary.

Skin Protection: Wear chemical protective clothing e.g. gloves, aprons, boots. In some operations: wear a chemical protective, full-body encapsulating suit and self-contained breathing apparatus (SCBA). Suitable materials include: Butyl rubber, Frontline® 500, AlphaTec® 4000, Tychem® (6000, 6000 FR, 9000, Responder® CSM, 10000, 10000 FR), Zytron® 500.

Not recommended: natural rubber, neoprene rubber, nitrile rubber, polyvinylchloride PVC, Viton®, Tychem® 5000, Zytron® 300.

Respiratory Protection:

Up to 100 ppm:
(APF = 10) Any supplied-air respirator*.
(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against hydrogen sulfide.
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against hydrogen sulfide or any self-contained breathing apparatus with a full facepiece.

*Reported to cause eye irritation or damage; may require eye protection.

APF = Assigned Protection Factor

Recommendations apply only to National Institute for Occupational Safety and Health (NIOSH) approved respirators. Refer to the NIOSH Pocket Guide to Chemical Hazards for more information.

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