



Advisory  
New York State Office of Homeland Security  
September 26, 2008  
Emergency Managers Advisory

General  
Message  
Green

David A. Paterson  
Governor

This communication is Sensitive.

Frank Tabert  
Deputy Director

The New York State Office of Homeland Security (OHS) is in receipt of the following Department of Homeland Security (DHS) Office of Intelligence Analysts Note titled, "Hydrogen Sulfide: A Potential First Responder Hazard." It is being forwarded in its entirety to the emergency manager community for situational awareness purposes.

Aviation Sector All international & domestic flights Alert Level <b>4 – Orange High</b>
United States Alert Level <b>3 – Yellow Elevated</b>
New York State Alert Level <b>3 – Yellow Elevated</b>
New York City Alert Level <b>4 – Orange High</b>

**Subject: (U) Hydrogen Sulfide: A Potential First Responder Hazard**

[Begin DHS Bulletin]

**26 September 2008**

*(U) Prepared by the WMD and Health Security Branch and the Los Angeles Joint Regional Intelligence Center.*

## (U) Scope

(U//FOUO) DHS/Office of Intelligence and Analysis and the Los Angeles Joint Regional Intelligence Center produced this note to alert first responders to the potential hazards posed by hydrogen sulfide gas because of a recent incident in Pasadena, California. The incident was a suicide, although it demonstrated the potential for easily produced hydrogen sulfide to be used as a chemical weapon in a terrorist attack.

## (U) Key Findings

*(U//FOUO) DHS/Office of Intelligence and Analysis (I&A) and the Los Angeles Joint Regional Intelligence Center (JRIC) assess that an intentional release of hydrogen sulfide gas most likely would be by a person using it to commit suicide, thus not exposing large numbers of people. The gas is, however, highly toxic and easy to produce from commonly available materials—properties that could make it attractive for use in a terrorist attack. DHS/I&A and JRIC have no information that terrorists are planning an attack in the United States using hydrogen sulfide gas.*

*(U//FOUO) Potential production of hydrogen sulfide gas may be identified by the collection of commonly used household items such as some paints, pesticides, toilet bowl cleaners, and disinfectants.*

## (U) Hydrogen Sulfide at Incident Sites

(U//FOUO) When responding to incidents, especially possible suicides, first responders should be aware of the possibility of encountering hydrogen sulfide gas, a potentially lethal toxic industrial chemical.\* DHS/I&A and the Los Angeles JRIC assess that an intentional release would most likely result from a suicide, but the

planning attacks in the United States using hydrogen sulfide gas, although first responders should exercise caution if they suspect the presence of hydrogen sulfide.

\* (U) Hydrogen sulfide is a byproduct of the decay of organic material and accidental exposure has occurred in situations involving sewage, liquid manure, natural gas, and animal or vegetable matter storage or processing. It also is found at some industrial facilities, such as wastewater treatment plants, petroleum refineries, pulp and paper manufacturers, and plants producing sulfur or sulfuric acid.

## (U) Properties and Methods of Production

(U//FOUO) Hydrogen sulfide is a colorless, toxic, and flammable gas with a strong odor of rotten eggs at low concentrations. Its odor is not a reliable indicator of its presence, however, because high concentrations or continuous exposure deaden the sense of smell. It can be produced by mixing a sulfur source, such as certain paints and pesticides, with an acid, such as those found in toilet bowl cleaners and disinfectants (see Table 1). The extent of the hazard will depend on the concentration of the reactive sulfur and acid in the tem used.

**Table 1. (U) Examples of household items that can be used to produce hydrogen sulfide.**

Acid Sources	Sulfur Sources
Lysol® Ready to Use Disinfectant (4–8 percent citric and hydroxyacetic acid)	Artist oil paints (0–15 percent zinc sulfide)
Lysol® Toilet Bowl Cleaner (9.5 percent HCl)	Dandruff shampoos (1.0 percent selenium sulfide)
Sno Bol® Toilet Cleaner (15 percent HCl)	Pesticides (5–30 percent calcium polysulfides)
The Works® Toilet Bowl Cleaner (15–25 percent HCl)	Spackling paste (1–2 percent zinc sulfide)
Blu-Lite® Germicidal Acid Bowl Cleaner (20.5 percent phosphoric acid)	Some latex paints (6.6 percent zinc sulfide)
Kaboom® Shower, Tub, and Tile Cleaner (5–7 percent urea-monohydrochloric acid)	Garden fungicides (5-90 percent sulfur)
Tile, stone cleaners (1-30 percent HCl)	
UNCLASSIFIED//FOR OFFICIAL USE ONLY	

## (U) Health Hazards

(U) Effects of exposure to hydrogen sulfide include the following:

— (U) **Low concentrations:** eye irritation, sore throat, cough.

— (U) **Intermediate concentrations:** shortness of breath, headache, dizziness, nausea, vomiting, pulmonary edema.

— (U) **High concentrations:** potentially fatal; exposure to concentrations at 800-1,000 parts per million or greater can result in immediate collapse with loss of breathing, even after a single breath.

## (U) Use in Suicides

(U//FOUO) Inhalation of hydrogen sulfide has become a popular means of committing suicide in Japan and could become more popular in the United States as publicity about these incidents spreads.



(U) Firefighters respond to a suicide in Pasadena

— (U) In August 2008, law enforcement and fire units responded to a suicide involving hydrogen sulfide in Pasadena, California. The victim, found dead in his car, had mixed a fungicide and a toilet bowl cleaner in a plastic tray. First responders saw the tray with a “bright blue liquid” in the back seat of the vehicle. The man had placed a note on the car to warn first responders. Investigation indicated that he may have visited one or more of the numerous Japanese websites that provide information on how to commit suicide using hydrogen sulfide.

— (U) In Japan, press reports indicated that during the first six months of 2008, more than 500 people had killed themselves by inhaling hydrogen sulfide produced by mixing commonly available chemicals. Many of these incidents occurred in vehicles, apartments, or houses.

## (U) Potential Use by Terrorists

(U//FOUO) Terrorist training manuals have discussed using hydrogen sulfide gas in an attack. DHS/I&A and the JRIC assess that the chemical reactions described in the manuals are viable and would yield hydrogen sulfide, but no information indicates that a terrorist attack is imminent using this chemical.

— (U//FOUO) The “Mujahideen Poisons Handbook” describes producing hydrogen sulfide gas by reacting sodium sulfide and sulfuric acid.

— (U//FOUO) Another terrorist training manual proposes mixing hydrochloric acid and iron sulfide.

***(U//FOUO) DHS/I&A and the JRIC assess that it would be difficult for terrorists to create fatal concentrations of hydrogen sulfide in large open areas because the gas would dissipate; however, terrorists could use it in enclosed spaces to cause disruption and panic, based on the circumstances of non-terrorist-related events.***

— (U) The discovery of the suicide victim in Pasadena led to the evacuation of several businesses in the immediate area and left bystanders stranded for up to five hours while responders assessed the scene.

— (U) In one incident in Japan, 90 people in an apartment building reportedly were sickened when a teenage girl killed herself in the bathroom of her apartment by mixing household items that produced hydrogen sulfide.

## (U) Implications

(U) Hydrogen sulfide is a dangerous, easily produced toxic industrial chemical that can cause health hazards at even low concentrations. If the presence of hydrogen sulfide is suspected at an incident site, responders should follow their agencies’ HAZMAT protocols.

[End DHS Bulletin]

As always, observance of suspicious individuals and activities should immediately be reported to the New York State Intelligence Center-Counter Terrorism Center, Terrorism Tips Line at **1-866-SAFE-NYS**.

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SENSITIVE**



**MATERIAL SAFETY DATA SHEET**

**PRODUCT NAME: HYDROGEN SULFIDE IN HYDROGEN (0.1 PPM TO 5%)**

**1. Chemical Product and Company Identification**

**BOC Gases,  
Division of  
The BOC Group, Inc.  
575 Mountain Avenue  
Murray Hill, NJ 07974**

**BOC Gases  
Division of  
BOC Canada Limited  
5975 Falbourne Street, Unit 2  
Mississauga, Ontario L5R 3W6**

**TELEPHONE NUMBER:** (908) 464-8100  
**24-HOUR EMERGENCY TELEPHONE NUMBER:**  
CHEMTREC (800) 424-9300

**TELEPHONE NUMBER:** (905) 501-1700  
**24-HOUR EMERGENCY TELEPHONE NUMBER:**  
(905) 501-0802  
**EMERGENCY RESPONSE PLAN NO:** 20101

**PRODUCT NAME:** HYDROGEN SULFIDE IN HYDROGEN (0.1 PPM TO 5%)  
**CHEMICAL NAME:** Hydrogen Sulfide in Hydrogen  
**COMMON NAMES/SYNONYMS:** Not Available  
**TDG (Canada) CLASSIFICATION:** 2.1  
**WHMIS CLASSIFICATION:** A, B1, D1A, D2A

**PREPARED BY:** Loss Control (908)464-8100/(905)501-1700  
**PREPARATION DATE:** 6/1/95  
**REVIEW DATES:** 6/11/96

**2. Composition, Information on Ingredients**

INGREDIENT	% VOLUME	PEL-OSHA <sup>1</sup>	TLV-ACGIH <sup>2</sup>	LD <sub>50</sub> or LC <sub>50</sub> Route/Species
Hydrogen Sulfide FORMULA: H <sub>2</sub> S CAS: 7783-06-4 RTECS #: MX1225000	< 0.0001 to 5.0	20 ppm Ceiling	10 ppm TWA 15 ppm STEL	LC <sub>50</sub> 444 ppm (rat)
Hydrogen FORMULA: H <sub>2</sub> CAS: 1333-74-0 RTECS #: MW8900000	95.0 to 99.995	Simple Asphyxiant	Simple Asphyxiant	Not Available

<sup>1</sup> As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)

<sup>2</sup> As stated in the ACGIH 1994-95 Threshold Limit Values for Chemical Substances and Physical Agents

**3. Hazards Identification**

**EMERGENCY OVERVIEW**  
Irritating to the eyes, mucous membranes and respiratory system. Inhaled gas inhibits cellular respiration resulting in pulmonary paralysis, sudden collapse and death. Extremely flammable.

**ROUTE OF ENTRY:**

Skin Contact Yes	Skin Absorption No	Eye Contact Yes	Inhalation Yes	Ingestion Yes
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PRODUCT NAME: HYDROGEN SULFIDE IN HYDROGEN (0.1 PPM TO 5%)

**HEALTH EFFECTS:**

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

Carcinogenicity: -- NTP: No IARC: No OSHA: No

**NFPA HAZARD CODES**

Health: 4 (as H<sub>2</sub>S)  
Flammability: 4  
Reactivity: 0

**HMIS HAZARD CODES**

Health: 4 (as H<sub>2</sub>S)  
Flammability: 4  
Reactivity: 0

**RATINGS SYSTEM**

0 = No Hazard  
1 = Slight Hazard  
2 = Moderate Hazard  
3 = Serious Hazard  
4 = Severe Hazard

**EYE EFFECTS:**

Low concentrations of hydrogen sulfide will generally cause irritation to the conjunctiva. Repeated exposure to low concentrations is reported to cause conjunctivitis, photo phobia, corneal bullae, tearing, pain and blurred vision.

**SKIN EFFECTS:**

May irritate the skin upon contact.

**INGESTION EFFECTS:**

Ingestion is considered unlikely. However, hydrogen sulfide will cause irritation of mucous membranes, causing a burning feeling with excess salivation likely. Irritation of the gastrointestinal tract may also occur.

**INHALATION EFFECTS:**

Hydrogen sulfide reacts with enzymes in the bloodstream and inhibits cellular respiration resulting in pulmonary paralysis, sudden collapse and death. Continuous exposure to low (15-50 ppm) concentrations will generally cause irritation to mucous membranes, and may also cause headache, dizziness or nausea. Higher concentrations (200-300 ppm) may result in respiratory arrest leading to coma or unconsciousness. Exposures for more than 30 minutes at concentrations greater than 700 ppm have been fatal.

Continuous inhalation of low concentrations may cause olfactory fatigue or paralysis of the sense of smell. Thus, detection of hydrogen sulfide by its odor is not effective.

Toxic effects observed in newborn rats after exposure of pregnant females to 20 ppm hydrogen sulfide.

#### 4. First Aid Measures

**EYES:**

PERSONS WITH POTENTIAL EXPOSURE TO HYDROGEN SULFIDE SHOULD NOT WEAR CONTACT LENSES. In case of eye contact, immediately flush with low pressure, cool water for at least 15 minutes, opening eyelids to ensure flushing. Get immediate medical attention.

**SKIN:**

Flush affected area with copious quantities of water. Remove affected clothing as rapidly as possible. Seek immediate medical attention.

**INGESTION:**

Treat in a manner similar to inhalation exposure. Seek medical attention as soon as possible.

**INHALATION:**

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. An extreme fire hazard exists when rescuing semiconscious and unconscious persons due to the flammability hazard. Avoid use of rescue equipment which may contain ignition sources or cause static discharge.

Quick removal from the contaminated area is most important. Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Unconscious persons should be moved to an uncontaminated area, and given artificial resuscitation and supplemental oxygen if they are not breathing. Further treatment should be symptomatic and supportive. Keep the victim warm and calm.

#### 5. Fire Fighting Measures

Conditions of Flammability: Flammable		
Flash point: Not Available	Method: Not Applicable	Autoignition: Temperature: 1085 °F (585 °C)
LEL(%): 4		UEL(%): 74.5
Hazardous combustion products: None		
Sensitivity to mechanical shock: None		
Sensitivity to static discharge: None		

**FIRE AND EXPLOSION HAZARDS:**

Hydrogen and hydrogen sulfide are both very flammable. Eliminate all sources of ignition. Hydrogen gas is very light and rises very rapidly in air. Increase ventilation to prevent an explosion hazard, particularly in the upper portions of buildings or sheds where the gas might collect. Keep apparatus away from areas where flammable gas may accumulate.

**EXTINGUISHING MEDIA:**

Water, carbon dioxide, dry chemical.

**FIRE FIGHTING INSTRUCTIONS:**

If possible, stop the flow of gas. Use water spray to cool surrounding containers. Reduce the rate of flow and inject an inert gas, if possible, before completely stopping the hydrogen flow (to help prevent a flashback). Do not extinguish the fire until the supply is shut off as otherwise an explosion re-ignition may occur.

Never enter a flammable atmosphere! Cool surrounding containers with water spray. Hydrogen burns with an almost invisible, almost silent, flame of relatively low thermal radiation. Caution should be used when determining if the flame has been extinguished. Do not detect leaks with hands or open flame.

Should the fire be extinguished and the flow of gas continue, increased ventilation must be used to prevent a buildup of hydrogen gas, thus creating an explosion hazard. Keep non-essential personnel away from the immediate area. Use only spark proof tools to close open valves.

Keep all apparatus upwind and away from areas where concentrations of flammable gas may accumulate. A water fog may be used to create ventilation. Ventilation fans must be explosion proof.

Personnel may need approach type protective suits and positive pressure self-contained breathing apparatus. Regular fire fighters turnout gear may not be adequate.

## **6. Accidental Release Measures**

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with inert gas prior to attempting repairs. If leak is in container or container valve, contact the appropriate emergency telephone number listed in Section 1 or call your closest BOC location.

Stop the flow of gas using a valve in a remote location if possible. Extinguish all ignition sources. Ventilate area to prevent buildup of flammable/explosive atmospheres. Since hydrogen gas is very light, it will rise and may be trapped in higher portions of the building. All electrical equipment must be explosion proof if used to ventilate a leak area. Keep non-essential personnel away at all times.

## **7. Handling and Storage**

Earth ground and bond all lines and equipment associated with the germane system. Electrical equipment should be non-sparking or explosion proof.

Use only in well-ventilated areas. Stationary customer site vessels should be operated in accordance with the manufacturer's and BOC instructions. Do not attempt to repair, adjust or in any other way modify the operation of these vessels. If there is a malfunction or other type of operations problem with the vessel, contact the closest BOC location immediately for assistance.

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. DO NOT allow the temperature where cylinders are stored to exceed 125°F (52°C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time.

Valve protection caps must remain in place unless container is secured with valve outlet piping to use point. Close valve after each use and when the container is empty. Do not drag, slide or roll cylinders on their sides. Use a suitable hand truck for container movement. Use a pressure reducing regulator when connecting container to piping or systems. Do not use gas directly from container. Do not heat container by any means to increase the discharge rate of product from the container.

For additional information, consult the Compressed Gas Association (CGA) pamphlets P-1, P-14, G-5, G-12, Safety Bulletin SB-2 and OSHA Subpart H. NFPA 50A covers gaseous hydrogen at consumer sites. 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.



PRODUCT NAME: HYDROGEN SULFIDE IN HYDROGEN (0.1 PPM TO 5%)

## 8. Exposure Controls, Personal Protection

### EXPOSURE LIMITS<sup>1</sup>:

INGREDIENT	% VOLUME	PEL-OSHA <sup>2</sup>	TLV-ACGIH <sup>3</sup>	LD <sub>50</sub> or LC <sub>50</sub> Route/Species
Hydrogen Sulfide FORMULA: H <sub>2</sub> S CAS: 7783-06-4 RTECS #: MX1225000	< 0.0001 to 5.0	20 ppm Ceiling	10 ppm TWA 15 ppm STEL	LC <sub>50</sub> 444 ppm (rat)
Hydrogen FORMULA: H <sub>2</sub> CAS: 1333-74-0 RTECS #: MW8900000	95.0 to 99.995	Simple Asphyxiant	Simple Asphyxiant	Not Available

<sup>1</sup> Refer to individual state of provincial regulations, as applicable, for limits which may be more stringent than those listed here.

<sup>2</sup> As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)

<sup>3</sup> As stated in the ACGIH 1994-1995 Threshold Limit Values for Chemical Substances and Physical Agents.

### ENGINEERING CONTROLS:

Use local exhaust ventilation to reduce concentrations to within current exposure limits. A laboratory type hood is suitable for handling small or limited quantities.

### EYE/FACE PROTECTION:

Gas tight chemical goggles or full-face piece respirator.

### SKIN PROTECTION:

Protective gloves: neoprene, butyl rubber, PVC, polyethylene.

### RESPIRATORY PROTECTION:

Level C respiratory protection with full face piece equipped with an escape bottle or a self-contained breathing apparatus should be available for emergency use, or when concentrations exceed exposure limits.

### OTHER/GENERAL PROTECTION:

Safety shoes, safety shower, eyewash "fountain".

## 9. Physical and Chemical Properties

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Liquid	
Vapor pressure	: Supercritical	psia
Vapor density at 0 °C(Air = 1)	: 0.07	
Evaporation point	: Not Available	
Boiling point	: -423.2	°F
	: -252.8	°C
Freezing point	: -434.8	°F
	: -259.2	°C
pH	: Not Available	
Specific gravity	: Not Available	
Oil/water partition coefficient	: Not Available	
Solubility (H2O)	: Slight	
Odor threshold	: Not Available	
Odor and appearance	: A colorless, flammable gas or liquid with a rotten egg odor.	

## 10. Stability and Reactivity

### STABILITY:

Stable

### INCOMPATIBLE MATERIALS:

Fluorine and hydrogen react at 121°F (-250°C) when impurities are present. Chlorine/hydrogen mixtures are stable in the dark, but explode if exposed to light. Lithium metal will burn to the hydride in a hydrogen atmosphere. Dangerously reactive with oxidizers.

### HAZARDOUS DECOMPOSITION PRODUCTS

Oxides of sulfur.

### HAZARDOUS POLYMERIZATION:

Will not occur.

## 11. Toxicological Information

### REPRODUCTIVE:

Toxic effects observed in newborn rats after exposure of pregnant female to 20 ppm hydrogen sulfide.

## 12. Ecological Information

### OTHER ENVIRONMENTAL INFORMATION:

This product does NOT contain any ingredients which are regulated on the U.S. EPA List of Toxic Chemicals (40 CFR 372), and is therefore not subject to release reporting under Section 313 of EPCRA/SARA Title III.

## 13. Disposal Considerations

**PRODUCT NAME: HYDROGEN SULFIDE IN HYDROGEN (0.1 PPM TO 5%)**

Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED, WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to BOC Gases or authorized distributor for proper disposal.

#### 14. Transport Information

PARAMETER	United States DOT	Canada TDG
PROPER SHIPPING NAME:	Compressed gases, flammable, n.o.s. (Hydrogen Sulfide in Hydrogen)	Compressed gases, flammable, n.o.s. (Hydrogen Sulfide in Hydrogen)
HAZARD CLASS:	2.1	2.1
IDENTIFICATION NUMBER:	UN 1954	UN 1954
SHIPPING LABEL:	FLAMMABLE GAS	FLAMMABLE GAS

#### 15. Regulatory Information

**OTHER ENVIRONMENTAL INFORMATION:**

This product does NOT contain any ingredients which are regulated on the U.S. EPA List of Toxic Chemicals (40 CFR 372), and is therefore not subject to release reporting under Section 313 of EPCRA/SARA Title III.

**SARA TITLE III NOTIFICATIONS AND INFORMATION**

**SARA TITLE III - HAZARD CLASSES:**

- Acute Health Hazard
- Chronic Health Hazard
- Fire Hazard
- Sudden Release of Pressure Hazard

#### 16. Other Information

Compressed gas cylinders shall 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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