Date of Issue:
25 March 2015

SAFETY DATA SHEET

1. Substance and Source Identification

Product Identifier

SRM Number: 2731
SRM Name: Hydrogen Sulfide in Nitrogen (Nominal Amount-of-Substance Fraction 20 µmol/mol)
Other Means of Identification: Not applicable.

Recommended Use of This Material and Restrictions of Use

This Standard Reference Material (SRM) is a primary gas mixture of hydrogen sulfide in nitrogen provided as a compressed gas in a DOT 3AL-specification aluminum (6061 alloy) cylinder equipped with a CGA-330 brass valve at a nominal pressure of 11.0 MPa (1600 psig). This cylinder with a water volume of 6 L provides the user with 0.73 m^3 (25.8 ft^3) of useable mixture. NIST recommends that this cylinder **NOT** be used below 0.7 MPa (100 psi).

Company Information

National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2300
Gaithersburg, Maryland 20899-2300

Telephone: 301-975-2200
FAX: 301-948-3730
E-mail: SRMMSDS@nist.gov
Website: http://www.nist.gov/srm

Emergency Telephone ChemTrec:
1-800-424-9300 (North America)
+1-703-527-3887 (International)

2. Hazards Identification

Classification

Physical Hazard: Compressed Gas.
Health Hazard: Simple Asphyxiant.

Label Elements

Symbol

Signal Word
WARNING

Hazard Statement(s)

H280 Contains gas under pressure; may explode if heated.
------ May displace oxygen and cause rapid suffocation.

Precautionary Statement(s)

P410 + P403 Protect from sunlight. Store in a well-ventilated place.

Hazards Not Otherwise Classified: Not applicable.

Ingredients(s) with Unknown Acute Toxicity: Not applicable.

3. Composition and Information on Hazardous Ingredients

Substance: Hydrogen sulfide in nitrogen, compressed gas

Other Designations:

Hydrogen sulfide: dihydrogen monosulfide; dihydrogen sulfide; H_2S.
Nitrogen: Dinitrogen, nitrogen compressed.

Components are listed in compliance with OSHA's 29 CFR 1910.1200; for the actual values see the Certificate of Analysis. Hydrogen sulfide (H_2S) is listed for informational purposes only, the percentage of H_2S in this gas mixture is below the OSHA cut-off limits for hazardous chemicals.

Hazardous Components	CAS Number	EC Number (EINECS)	Nominal Mass Concentration (%)
Nitrogen	7727-37-9	231-783-9	>99.99
Hydrogen sulfide	7783-06-4	231-977-3	0.0024

4. FIRST AID MEASURES

Description of First Aid Measures:

Inhalation: If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration or oxygen by qualified personnel. Seek immediate medical attention.

Skin Contact: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed.

Eye Contact: Immediately flush eyes, including under the eyelids with copious amounts of water for at least 15 minutes. Seek immediate medical attention.

Ingestion: Ingestion of a gas is unlikely. As this material is a gas, refer to the inhalation section.

Most Important Symptoms/Effects, Acute and Delayed: Harmful if inhaled, blood damage, difficulty breathing, and suffocation.

Indication of any immediate medical attention and special treatment needed, if necessary: If any of the above symptoms are present, seek immediate medical attention.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Negligible fire hazard applicable to the identified NIST cylinder. Cylinders may rupture or explode if exposed to heat. See Section 9, "Physical and Chemical Properties" for flammability properties.

Extinguishing Media:
Suitable: Use extinguishing media appropriate to the surrounding fire.
Unsuitable: None listed.

Specific Hazards Arising from the Chemical: Oxides of nitrogen, oxides of carbon.

Special Protective Equipment and Precautions for Fire-Fighters: Move cylinder from fire area if it can be done without personal risk. Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH approved self-contained breathing apparatus (SCBA).

NFPA Ratings (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)

Health = 1 Fire = 0 Reactivity = 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures: Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment; see Section 8, "Exposure Controls and Personal Protection". Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.

Methods and Materials for Containment and Clean up: Stop leak if possible without personal risk. Isolate hazard area and deny entry. Stay upwind and keep out of low areas.

7. HANDLING AND STORAGE

Safe Handling Precautions: Use only with adequate ventilation. Do not puncture or incinerate container. Close valve after each use and when empty. Keep valve protection cap on cylinder when not in use.

Storage: Store and handling in accordance with all current regulations and standards. Secure cylinder to prevent physical damage. Keep separated from incompatible substances (oxidizing materials, halogens, metal oxides, metals, combustible materials, lithium). Store in well-ventilated area. Subject to storage regulations, OSHA 29 CFR 1910.101.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits			
Components	**OSHA (PEL)**	**ACGIH (TLV)**	**NIOSH (REL)**
Nitrogen	No occupational exposure limits	Simple asphyxiant	No occupational exposure limits
Hydrogen sulfide	TWA: 28 mg/m^3 (20 ppm)	TWA: 1.3 mg/m^3 (1 ppm)	IDLH: 139 mg/m^3 (100 ppm) Ceiling: 15 mg/m^3 (10 ppm) 10 min

Engineering Controls: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

Personal Protection: In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.

Respiratory Protection: If workplace conditions warrant a respirator, a respiratory protection program that meets OSHA 29 CFR 1910.134 must be followed. Refer to NIOSH 42 CFR 84 for applicable certified respirators.

Eye/Face Protection: Wear safety goggles. An eye wash station should be readily available near areas of use.

Skin and Body Protection: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Chemical-resistant gloves should be worn at all times when handling chemicals.

9. PHYSICAL AND CHEMICAL PROPERTIES

Descriptive Properties	**Nitrogen (>99.99 %)**	**Hydrogen sulfide (0.0024 %)**
Appearance (physical state, color, etc.)	colorless compressed gas	colorless compressed gas
Molecular Formula	N_2	H_2S
Molar Mass (g/mol)	28	34.08
Odor	odorless	rotten egg odor
Odor threshold	not available	0.05 ppm
pH	not applicable	4.5 to 7
Evaporation rate	not applicable	not available
Melting point/freezing point	–210 ºC (–346 ºF)	–86 ºC (–122.8 ºF)
Density (kg/m^3)	1.2506	1.406 at 25 ºC
Vapor Pressure	760 mmHg at –196 ºC	18.15 atm at 21 ºC
Vapor Density (air = 1)	0.967	1.2
Viscosity (cP)	0.01787 at 27 ºC	0.01657 at 0 ºC
Solubility(ies)	water, 1.6 % at 20 ºC; liquid ammonia	water, 225.7 % at 25 ºC; soluble in alcohol, carbon disulfide, ether, glycerol, gasoline, kerosene, crude oil, alkali solutions
Partition coefficient (n-octanol/water)	not available	not available
Thermal Stability Properties		
Autoignition Temperature	not applicable	260 ºC (500 ºF)
Thermal Decomposition	not applicable	not available
Initial boiling point and boiling range	–196 ºC (–321 ºF)	–61 to –60.3 ºC (–77.8 to –76.5 ºF)
Explosive Limits, LEL	not applicable	4 % to 4.3 % by volume
Explosive Limits, UEL	not applicable	44 % to 46 % by volume
Flash Point	not applicable	not available
Flammability (solid, gas)	not applicable	not available

10. STABILITY AND REACTIVITY

Reactivity: Stable at normal temperature and pressure.

Stability: X Stable _____ Unstable

Possible Hazardous Reactions: None listed.

Conditions to Avoid: Avoid heat, flames, sparks, and other sources of ignition. Minimize contact with material. Containers may rupture or explode if exposed to heat.

Incompatible Materials: Oxidizing materials, halogens, metal oxides, metals, combustible materials, metal salts, bases.

Fire/Explosion Information: See Section 5, "Fire Fighting Measures".

Hazardous Decomposition: Miscellaneous decomposition products.

Hazardous Polymerization: _____ Will Occur X Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Exposure: X Inhalation _____ Skin _____ Ingestion

Symptoms Related to the Physical, Chemical and Toxicological Characteristics: Nausea, vomiting, chest pain, difficulty breathing, irregular heartbeat, headache, disorientation, emotional disturbances, pain in extremities, tremors, loss of coordination, hearing loss, and visual disturbances.

Potential Health Effects (Acute, Chronic and Delayed)

Inhalation

Hydrogen sulfide: Acute exposure to concentrations of 5 ppm to 50 ppm may result in mucous membrane irritation. The severity of toxic effects increase as the concentration of hydrogen sulfide increases. Exposure to 100 to 200 ppm for 1 to 8 hours may result in dyspnea, hemorrhage, and death. Exposure to 600 ppm may be fatal within 30 minutes. Chronic or repeated exposure to small concentrations may result in hypoxic tissue damage producing neurological deficit similar to those resulting from more severe asphyxiant exposure. The concentration of hydrogen sulfide contained in this gas mixture is 5 ppm.

Nitrogen: Nitrogen compressed gas is a simple asphyxiant. Release in an enclosed space may result in asphyxiation. The symptoms of asphyxia depend on the rapidity with which the oxygen deficiency develops and how long it continues. In sudden acute asphyxia, unconsciousness may be immediate. With slow development, there may be rapid respiration and pulse, air hunger, dizziness, reduced awareness, tightness in the head, tingling sensations, incoordination, faulty judgment, emotional instability, and rapid fatigue. As the asphyxia progresses, nausea, vomiting, collapse, unconsciousness, convulsions, deep coma, and death are possible.

Skin Contact: No information on significant adverse effects from exposure to this gas mixture.

Eye Contact: Exposure to concentrations above 5 ppm may result in irritation.

Ingestion: Ingestion of a gas is unlikely under normal conditions of use. As this material is a gas, refer to the inhalation section.

Numerical Measures of Toxicity

Acute Toxicity: Not classified, concentration of hydrogen sulfide is below cut off value of 1 %.
Hydrogen sulfide; Rat, Inhalation LC50: 444 ppm (4 h)
Nitrogen; Simple asphyxiant

Skin Corrosion/Irritation: Not applicable.

Serious Eye damage/ Eye irritation: Not applicable.

Respiratory Sensitization: No data available.

Skin Sensitization: No data available.

Germ Cell Mutagenicity: Not classified.

Carcinogenicity: Not classified.
Listed as a Carcinogen/Potential Carcinogen _____ Yes X No
Nitrogen and hydrogen sulfide are not listed by NTP, IARC or OSHA as a carcinogen.

Reproductive Toxicity: Not classified, concentration of hydrogen sulfide is below cut off value of 0.1 %.
Hydrogen sulfide; Rat, Inhalation TCLo: 20 ppm (pregnant, 6 d to 22 d, 21 d).

Specific Target Organ Toxicity, Single Exposure: Not classified.

Specific Target Organ Toxicity, Repeated Exposure: Not classified, concentration of hydrogen sulfide is below cut off value of 1 %.

Aspiration Hazard: Not applicable.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data:
Hydrogen sulfide
Fish: bluegill (*Lepomis macrochirus*) LC50: 0.0448 mg/L flow-through (96 h)

Persistence and Degradability: No data available.

Bioaccumulative Potential: No data available.

Mobility in Soil: No data available.

Other Adverse effects: No data available.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose of waste in accordance with all applicable federal, state, and local regulations. Hydrogen sulfide subject to disposal regulations, U.S. EPA 40 CFR 262, Hazardous Waste Number: U135.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: UN1956; Compressed gas, n.o.s. (hydrogen sulfide in nitrogen); Hazard Class 2.2.

15. REGULATORY INFORMATION

U.S. Regulations:

CERCLA Sections 102a/103 (40 CFR 302.4): Identified cylinder not regulated.

SARA Title III Section 302 (40 CFR 355.30): Identified cylinder not regulated.

SARA Title III Section 304 (40 CFR 355.40): Identified cylinder not regulated.

SARA Title III Section 313 (40 CFR 372.65): Identified cylinder not regulated.

OSHA Process Safety (29 CFR 1910.119): Identified cylinder not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE HEALTH:	Yes.
CHRONIC HEALTH:	No.
FIRE:	No.
REACTIVE:	No.
PRESSURE:	Yes.

State Regulations:
California Proposition 65: Not listed.

U.S. TSCA Inventory: Hydrogen sulfide and nitrogen are listed.

TSCA 12(b), Export Notification: No components are listed.

Canadian Regulations: WHMIS Information is provided for this material.

16. OTHER INFORMATION

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Sources: ChemADVISOR, Inc., SDS, *Nitrogen, Compressed Gas*, 15 December 2014.

ChemADVISOR, Inc., SDS, *Hydrogen Sulfide*, 15 December 2014.

Hazardous Substances Data Bank (HSDB), National Library of Medicine's TOXNET system *Hydrogen sulfide* CAS No. 7783-06-4, available at http://toxnet.nlm.nih.gov/ (accessed Mar 2015).

Key of Acronyms:

ACGIH	American Conference of Governmental Industrial Hygienists	NRC	Nuclear Regulatory Commission
ALI	Annual Limit on Intake	NTP	National Toxicology Program
CAS	Chemical Abstracts Service	OSHA	Occupational Safety and Health Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PEL	Permissible Exposure Limit
CFR	Code of Federal Regulations	RCRA	Resource Conservation and Recovery Act
DOT	Department of Transportation	REL	Recommended Exposure Limit
EINECS	European Inventory of Existing Commercial Chemical Substances	RQ	Reportable Quantity
EPCRA	Emergency Planning and Community Right-to-Know Act	RTECS	Registry of Toxic Effects of Chemical Substances
IARC	International Agency for Research on Cancer	SARA	Superfund Amendments and Reauthorization Act
IATA	International Air Transportation Agency	SCBA	Self-Contained Breathing Apparatus
IDLH	Immediately Dangerous to Life and Health	SRM	Standard Reference Material
LC50	Lethal Concentration	STEL	Short Term Exposure Limit
LD50	Median Lethal Dose or Lethal Dose, 50 %	TLV	Threshold Limit Value
LEL	Lower Explosive Limit	TPQ	Threshold Planning Quantity
MSDS	Material Safety Data Sheet	TSCA	Toxic Substances Control Act
NFPA	National Fire Protection Association	TWA	Time Weighted Average
NIOSH	National Institute for Occupational Safety and Health	UEL	Upper Explosive Limit
NIST	National Institute of Standards and Technology	WHMIS	Workplace Hazardous Materials Information System
n.o.s.	Not Otherwise Specified		

Disclaimer: Physical and chemical data contained in this SDS are provided only for use in assessing the hazardous nature of the material. The SDS was prepared carefully, using current references; however, NIST does not certify the data in the SDS. The certified values for this material are given in the NIST Certificate of Analysis.

Users of this SRM should ensure that the SDS in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srmmsds@nist.gov; or via the Internet at http://www.nist.gov/srm.