

SAFETY DATA SHEET

Hydrogen sulfide 25 µmol/mol and 3 others mix / Nitrogen

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1. IDENTIFICATION

A. Product name

- Hydrogen sulfide 25 µmol/mol and 3 others mix / Nitrogen

B. Recommended use and restriction on use

- General use : Not available
 - Restriction on use : Not available

C. Manufacturer / Supplier / Distributor information

○ Manufacturer information

- Company name : RIGAS Co.,Ltd
 - Address : 142,Munpyeongdong-ro 48 beon-gil, Daedeok-gu,Daejeon, KOREA
 - Dept. : Management Planning Dept.
 - Telephone number : 82-42-934-6900
 - Emergency telephone number : 82-42-934-6900
 - Fax number : 82-42-935-8814
 - E-mail address : master@rigas.co.kr

○ Supplier/Distributor information

- Company name : RIGAS Co.,Ltd
 - Address : 142,Munpyeongdong-ro 48 beon-gil, Daedeok-gu,Daejeon, KOREA
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2. HAZARD IDENTIFICATION

A. GHS Classification

- Gases under pressure : Compressed gas

B. GHS label elements

○ Hazard symbols



○ Signal words

- Warning

○ Hazard statements

- H280 Compressed gas ; Contains gas under pressure; may explode if heated

○ Precautionary statements

1) Prevention

- Not applicable

2) Response

- Not applicable

3) Storage

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

4) Disposal

- Not applicable

C. Other hazards which do not result in classification : (NFPA Classification)

o NFPA grade (0 ~ 4 level)

- Health : 0, Flammability : 0, Reactivity : 0

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	Trade names and Synonyms	CAS No.	Content(%)
Nitrogen	Nitrogen, Elemental ; Diazyne ; Dinitrogen ; Diatomic nitrogen ;	7727-37-9	Balance
Oxygen	Oxygen, compressed ; Dioxygen ; Oxygen molecule ; Oxygen, liquid ; Oxygen, refrigerated liquid (cryogenic liquid) ; Liquid oxygen ;	7782-44-7	18.05
Methane	Methyl hydride ; Fire damp	74-82-8	2.2
Carbon monoxide	Carbonic oxide ; Carbon monoxide, compressed gas ;	630-08-0	0.01
Hydrogen sulfide	Dihydrogen monosulfide ; Dihydrogen sulfide ; Hydrogen sulphide ; Hydrosulfuric acid ; Dihydrogen sulfide ; Sulfur hydride	7783-06-4	0.0025

4. FIRST AID MEASURES

A. Eye contact

- Do not rub your eyes.
- Immediately flush eyes with plenty of water for at least 15 minutes and call a doctor/physician.

B. Skin contact

- Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
- Laundering enough contaminated clothing before reuse.

C. Inhalation contact

- When exposed to large amounts of steam and mist, move to fresh air.
- Take specific treatment if needed.

D. Ingestion contact

- About whether I should induce vomiting Take the advice of a doctor.
- Rinse your mouth with water immediately.

E. Delayed and immediate effects and also chronic effects from short and long term exposure

- Not available

F. Notes to physician

- Notify medical personnel of contaminated situations and have them take appropriate protective measures.

5. FIREFIGHTING MEASURES

A. Suitable (Unsuitable) extinguishing media

- Dry chemical, carbon dioxide, regular foam extinguishing agent, spray
- Avoid use of water jet for extinguishing

B. Specific hazards arising from the chemical

- high-pressure gas; May explode when heated.

C. Special protective actions for firefighters

- Notify your local firestation and inform the location of the fire and characteristics hazard.
- Avoid inhalation of materials or combustion by-products.
- Do not access if the tank on fire.
- Use appropriate extinguishing measure suitable for surrounding fire.
- Wear appropriate protective equipment.
- Keep containers cool with water spray.
- Fine powder may cause ignition.

6. ACCIDENTAL RELEASE MEASURES

A. Personal precautions, protective equipment and emergency procedures

- Wear proper personal protective apparatus as indicated in Section 8 and avoid skin contact and inhalation.
- Ventilate closed spaces before entering.
- Must work against the wind, let the upwind people to evacuate.
- Move container to safe area from the leak area.
- Avoid dust formation.
- Moist with water to prevent dust scattering.

B. Environmental precautions

- Prevent runoff and contact with waterways, drains or sewers.
- If large amounts have been spilled, inform the relevant authorities.

C. Methods and materials for containment and cleaning up

- Large spill : Stay upwind and keep out of low areas. Dike for later disposal.
- Notification to central government, local government. When emissions at least of the standard amount
- Dispose of waste in accordance with local regulation.
- Appropriate container for disposal of spilled material collected.
- Dust spills : Cover dust spills with plastic sheet or waterproof cloth to minimize spreading and avoid contact with water.
- Small liquid state spills: Appropriate container for disposal of spilled material collected.
- For disposal of spilled material in appropriate containers collected and clear surface.

7. HANDLING AND STORAGE

A. Precautions for safe handling

- Since emptied containers retain product residue(vapor, liquid, solid) follow all MSDS and label warnings even after container is emptied.
- Avoid contact with incompatible materials.
- Get the manual before use.
- Do not handle until all safety precautions have been read and understood.
- Minimize occurrence of dust and accumulation.

B. Conditions for safe storage, including any incompatibilities

- Check regularly for leaks.
- Do not use damaged containers.
- Do not apply any physical shock to container.
- Keep in the original container.
- Keep sealed when not in use.
- Store in well ventilated area.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

A. Exposure limits

- o ACGIH TLV
 - [Methane] : TWA, 1000 ppm
 - [Carbon monoxide] : TWA, 25 ppm (29 mg/m³)

- [Hydrogen sulfide] : TWA, 1 ppm (1.4 mg/m³) STEL, 5 ppm (7 mg/m³)
- **OSHA PEL**
 - [Hydrogen sulfide]:(C) 20
 - [Carbon monoxide]:50ppm 55mg/m³

B. Engineering controls

- A system of local and/or general exhaust is recommended to keep employee exposures above the Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. The use of local exhaust ventilation is recommended to control emissions near the source.

C. Individual protection measures, such as personal protective equipment

- **Respiratory protection**
 - Under conditions of frequent use or heavy exposure, Respiratory protection may be needed.
 - Respiratory protection is ranked in order from minimum to maximum.
 - Consider warning properties before use.
 - Dust, mist, fume-purifying respiratory protection
 - Any air-purifying respirator with a corpuscle filter of high efficiency
 - Any respiratory protection with a electromotion fan(for dust, mist, fume-purifying)
 - Self-contained breathing apparatus with a corpuscle filter of high efficiency
 - For Unknown Concentration or Immediately Dangerous to Life or Health : Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply. Any self-contained breathing apparatus with a full facepiece.
- **Eye protection**
 - Wear primary eye protection such as splash resistant safety goggles with a secondary protection face shield.
 - Provide an emergency eye wash station and quick drench shower in the immediate work area.
- **Hand protection**
 - Wear appropriate chemical resistant glove.
- **Skin protection**
 - Wear appropriate chemical resistant protective clothing.
- **Others**
 - Not available

9. PHYSICAL AND CHEMICAL PROPERTIES

A. Appearance	H2S
- Appearance	gas
- Color	colorless
B. Odor	Rotten egg smell
C. Odor threshold	0.05 ppm
D. pH	4.5 (diluted with distilled water)
E. Melting point/Freezing point	-85 °C
F. Initial Boiling Point/Boiling Ranges	-60 °C
G. Flash point	Not available
H. Evaporation rate	Not available
I. Flammability(solid, gas)	Flammable gas
J. Upper/Lower Flammability or explosive limits	46 / 4.3 %
K. Vapour pressure	15600 mmHg (25 °C)
L. Solubility	0.5 g/100mℓ (20 °C)
M. Vapour density	1.19 (air=1)
N. Specific gravity	0.0017 (water=1)
O. Partition coefficient of n-octanol/water	0.23 (estimated)
P. Autoignition temperature	260 °C
Q. Decomposition temperature	Not available
R. Viscosity	0.0128 cP
S. Molecular weight	34.08

A. Appearance	CH4
- Appearance	gas

- Color	Colorless
B. Odor	odorless
C. Odor threshold	Not available
D. pH	Not available
E. Melting point/Freezing point	-183 °C
F. Initial Boiling Point/Boiling Ranges	-161 °C
G. Flash point	Not available
H. Evaporation rate	Not available
I. Flammability(solid, gas)	Flammable gas
J. Upper/Lower Flammability or explosive limits	15 / 5 %
K. Vapour pressure	466000 mmHg (25 °C)
L. Solubility	0.0022 g/100mℓ (25 °C)
M. Vapour density	0.554 (air = 1)
N. Specific gravity	Not available
O. Partition coefficient of n-octanol/water	1.09
P. Autoignition temperature	537 °C
Q. Decomposition temperature	Not available
R. Viscosity	0.01087 cP (20 °C)
S. Molecular weight	16.04

A. Appearance	CO (Carbon monoxide)
- Appearance	gas
- Color	Colorless
B. Odor	odorless
C. Odor threshold	Not available
D. pH	Not available
E. Melting point/Freezing point	-205 °C
F. Initial Boiling Point/Boiling Ranges	-191 °C
G. Flash point	Not available
H. Evaporation rate	Not available
I. Flammability(solid, gas)	Flammable gas
J. Upper/Lower Flammability or explosive limits	74.2 / 12.5 %
K. Vapour pressure	760 mmHg (-191 °C)
L. Solubility	2.3 g/100mℓ (20 °C)
M. Vapour density	0.97 (air=1)
N. Specific gravity	Not available
O. Partition coefficient of n-octanol/water	1.78 (estimated)
P. Autoignition temperature	605 °C
Q. Decomposition temperature	Not available
R. Viscosity	Not available
S. Molecular weight	28.01
A. Appearance	O₂
- Appearance	gas
- Color	Blue, colorless
B. Odor	Odorless
C. Odor threshold	Not available
D. pH	Not available
E. Melting point/Freezing point	-218 °C
F. Initial Boiling Point/Boiling Ranges	-183 °C
G. Flash point	Not available
H. Evaporation rate	Not available
I. Flammability(solid, gas)	Not available
J. Upper/Lower Flammability or explosive limits	Not available
K. Vapour pressure	760 mmHg (at -183 C)
L. Solubility	(Water solubility: 3.2% at 25 C Solvent solubility: Soluble: alcohol)

M. Vapour density	1.1 ((ai=1))
N. Specific gravity	1.1407 (at -183 C (water = 1))
O. Partition coefficient of n-octanol/water	0.65
P. Autoignition temperature	Not available
Q. Decomposition temperature	Not available
R. Viscosity	0.156 cP (at -173 C)
S. Molecular weight	31.9988
A. Appearance	N2
- Appearance	gas
- Color	Colorless
B. Odor	odorless
C. Odor threshold	Not available
D. pH	Not available
E. Melting point/Freezing point	-210 °C
F. Initial Boiling Point/Boiling Ranges	-196 °C
G. Flash point	Not available
H. Evaporation rate	Not available
I. Flammability(solid, gas)	Not available
J. Upper/Lower Flammability or explosive limits	Not available
K. Vapour pressure	1 atm (77.347 deg K)
L. Solubility	(1.18E+004mg/L(25°C))
M. Vapour density	0.97 ((air = 1))
N. Specific gravity	0.808 (kg / l at the boiling point of the liquid)
O. Partition coefficient of n-octanol/water	0.67
P. Autoignition temperature	Not available
Q. Decomposition temperature	Not available
R. Viscosity	Not available
S. Molecular weight	28

10. STABILITY AND REACTIVITY

A. Chemical Stability

- high-pressure gas; May explode when heated.

B. Possibility of hazardous reactions

- Contact with other combustible material may cause fire.

C. Conditions to avoid

- Avoid contact with incompatible materials and condition.
- Avoid : Accumulation of electrostatic charges, Heating, Flames and hot surfaces
- Avoid contact with heat, sparks, flame or other ignition sources.

D. Incompatible materials

- Not available

E. Hazardous decomposition products

- May emit flammable vapour if involved in fire.

11. TOXICOLOGICAL INFORMATION

A. Information on the likely routes of exposure

- (Respiratory tracts)
 - Not available
- (Oral)
 - Not available
- (Eye·Skin)
 - Not available

B. Delayed and immediate effects and also chronic effects from short and long term exposure

- **Acute toxicity**
 - * **Oral - ATE MIX : Not available**
 - Not available
 - * **Dermal - ATE MIX : Not available**
 - Not available
 - * **Inhalation - ATE MIX : Not available**
 - [Methane] : gas LC50 353553 ppm/4hr (LC50 500000/2hr) Mouse (RTECS)
 - [Carbon monoxide] : gas LC50 1805 ppm 4 hr Rat
 - [Hydrogen sulfide] : LC50 444 ppm 4 hr Rat
- **Skin corrosion/irritation**
 - Not available
- **Serious eye damage/irritation**
 - Not available
- **Respiratory sensitization**
 - Not available
- **Skin sensitization**
 - Not available
- **Carcinogenicity**
 - * **IARC**
 - Not available
 - * **OSHA**
 - Not available
 - * **ACGIH**
 - Not available
 - * **NTP**
 - Not available
 - * **EU CLP**
 - Not available
- **Germ cell mutagenicity**
 - Not available
- **Reproductive toxicity**
 - Not available
- **STOT-single exposure**
 - Not available
- **STOT-repeated exposure**
 - Not available
- **Aspiration hazard**
 - Not available

12. ECOLOGICAL INFORMATION

A. Ecotoxicity

- **Fish**
 - [Oxygen] : LC50 440.691 mg/l 96 hr (Estimate)
 - [Hydrogen sulfide] : LC50 0.007 mg/l 96 hr Oncorhynchus mykiss (ECOTOX)
- **Crustaceans**
 - [Oxygen] : LC50 430.164 mg/l 48 hr (Estimate)
 - [Methane] : LC50 164.244 mg/l 48 hr (Estimate)
 - [Hydrogen sulfide] : EC50 0.062 mg/l 48 hr Gammarus pseudolimnaeus (ECOTOX)
- **Algae**
 - [Oxygen] : EC50 248.819 mg/l 96 hr (Estimate)
 - [Methane] : EC50 95.717 mg/l 96 hr (Estimate)

B. Persistence and degradability

- **Persistence**
 - [Nitrogen] : log Kow 0.67 (NLM/HSDB)

- [Oxygen] : log Kow 0.65 (ICSC)
- [Methane] : log Kow 1.09
- [Carbon monoxide] : log Kow 1.78 (Estimate)
- [Hydrogen sulfide] : log Kow 0.23
- **Degradability**
 - Not available

C. Bioaccumulative potential

- **Bioaccumulative potential**
 - [Oxygen] : (Bioconcentration: Will not occur.)
 - [Methane] : BCF 1 (HSDB)
- **Biodegradation**
 - [Methane] : 65.7 (%) 35 day (HSDB)
 - [Hydrogen sulfide] : Non-biodegradable(because there is no data for rapid degradability and bioaccumulation potential)

D. Mobility in soil

- Not available

E. Other adverse effects

- Not available

13. DISPOSAL CONSIDERATIONS

A. Disposal methods

- Since more than two kinds of designaed waste is mixed, it is difficult to treat seperatly, then can be reduction or stabilization by incineration or similar process.
- If water separation is possible, pre-process with Water separation process.
- Dispose by incineration.

B. Special precautions for disposal

- The user of this product must disposal by oneself or entrust to waste disposer or person who other's waste recycle and dispose, person who establish and operate waste disposal facilities.
- Dispose of waste in accordance with all applicable laws and regulations.

14. TRANSPORT INFORMATION

A. UN No. (IMDG)

- 1956

B. Proper shipping name

- COMPRESSED GAS, N.O.S.

C. Hazard Class

- 2.2

D. IMDG Packing group

- Not applicable

E. Marine pollutant

- Not applicable

F. Special precautions for user related to transport or transportation measures

- Local transport follows in accordance with Dangerous goods Safety Management Law.
- Package and transport follow in accordance with Department of Transportation (DOT) and other regulatory agency requirements.
- Air transport(IATA): Not subject to IATA regulations.
- EmS FIRE SCHEDULE : F-C (Non-flammable gases)
- EmS SPILLAGE SCHEDULE : S-V (Gases (non-flammable, non-toxic))

15. REGULATORY INFORMATION

A. National and/or international regulatory information

- **POPs Management Law**
 - Not applicable
- **Information of EU Classification**
 - * **Classification**
 - [Oxygen] : O; R8
 - [Methane] : F+; R12
 - [Carbon monoxide] : F+; R12 Repr. Cat. 1; R61 T; R23-48/23
 - [Hydrogen sulfide] : F+; R12 T+; R26 N; R50
 - * **Risk Phrases**
 - [Oxygen] : R8
 - [Methane] : R12
 - [Carbon monoxide] : R61, R12, R23, R48/23
 - [Hydrogen sulfide] : R12, R26, R50
 - * **Safety Phrase**
 - [Oxygen] : S2, S17
 - [Methane] : S2, S9, S16, S33
 - [Carbon monoxide] : S53, S45
 - [Hydrogen sulfide] : S1/2, S9, S16, S36, S38, S45, S61
- **U.S. Federal regulations**
 - * **OSHA PROCESS SAFETY (29CFR1910.119)**
 - [Hydrogen sulfide] : 680.3985 kg 1500 lb
 - * **CERCLA Section 103 (40CFR302.4)**
 - [Hydrogen sulfide] : 45.3599 kg 100 lb
 - * **EPCRA Section 302 (40CFR355.30)**
 - [Hydrogen sulfide] : 226.7995 kg 500 lb
 - * **EPCRA Section 304 (40CFR355.40)**
 - [Hydrogen sulfide] : 45.3599 kg 100 lb
 - * **EPCRA Section 313 (40CFR372.65)**
 - [Hydrogen sulfide] : Applicable
- **Rotterdam Convention listed ingredients**
 - Not applicable
- **Stockholm Convention listed ingredients**
 - Not applicable
- **Montreal Protocol listed ingredients**
 - Not applicable

16. OTHER INFORMATION

A. Reference

- The information contained herein is believed to be accurate. It is provided independently of any sale of the product for purpose of hazard communication. It is not intended to constitute performance information concerning the product. No express warranty, or implied warranty of merchantability or fitness for a particular purpose is made with respect to the product or the information contained herein.
- This Safety Data Sheet was compiled with data and information from the following sources: KOSHA, NITE, ESIS, NLM, SIDS, IPCS

B. Issue date

- 2016-03-09

C. Revision number and Last date revised

- 2 times, 2016-01-18

D. Other

- This SDS is prepared according to the Globally Harmonized System (GHS).