

Nonflammable Gas Mixture: Carbon Monoxide / Hydrogen Sulfide / ISO-BUTANE / Nitrogen / Oxygen

Section 1. Chemical product and company identification

Product name	: Nonflammable Gas Mixture: Carbon Monoxide / Hydrogen Sulfide / ISO-BUTANE / Nitrogen / Oxygen
Supplier	: Chemtron Science Laboratories Pvt. Ltd. EL-47, Electronics Zone, MAHAPE MIDC, Navi Mumbai 400710 India
Product use	: Synthetic/Analytical chemistry.
MSDS #	: CSL-2255
Date of Preparation/Revision	: 4/19/2013.
In case of emergency	: +91-9223390320

Section 2. Hazards identification

Physical state	: Gas. DANGER! MAY BE FATAL IF INHALED. MAY CAUSE EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CONTENTS UNDER PRESSURE. Do not puncture or incinerate container. Do not breathe gas. Avoid contact with eyes, skin and clothing. Contains material that may cause target organ damage, based on animal data. Use only with adequate ventilation. Wash thoroughly after handling. Keep container closed. Contact with rapidly expanding gases can cause frostbite.
Target organs	: Contains material which may cause damage to the following organs: blood, lungs, the nervous system, heart, cardiovascular system, upper respiratory tract, eyes, central nervous system (CNS).
Routes of entry	: Inhalation Dermal Eyes
Potential acute health effects	
Eyes	: Moderately irritating to eyes. Contact with rapidly expanding gas may cause burns or frostbite.
Skin	: Moderately irritating to the skin. Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	: Very toxic by inhalation.
Ingestion	: Ingestion is not a normal route of exposure for gases
Potential chronic health effects	
Chronic effects	: Contains material that may cause target organ damage, based on animal data.
Target organs	: Contains material which may cause damage to the following organs: blood, lungs, the nervous system, heart, cardiovascular system, upper respiratory tract, eyes, central nervous system (CNS).
Medical conditions aggravated by over-exposure	: Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (Section 11)

Section 3. Composition, Information on Ingredients

<u>Name</u>	<u>CAS number</u>	<u>% Volume</u>	<u>Exposure limits</u>
Nitrogen	7727-37-9	72 - 99	Oxygen Depletion [Asphyxiant]
Oxygen	7782-44-7	1 - 19.5	
Carbon Monoxide	630-08-0	0.0025 - 5	<p>ACGIH TLV (United States, 2/2010). TWA: 29 mg/m³ 8 hour(s). TWA: 25 ppm 8 hour(s).</p> <p>NIOSH REL (United States, 6/2009). CEIL: 229 mg/m³ CEIL: 200 ppm TWA: 40 mg/m³ 10 hour(s). TWA: 35 ppm 10 hour(s).</p> <p>OSHA PEL (United States, 6/2010). TWA: 55 mg/m³ 8 hour(s). TWA: 50 ppm 8 hour(s).</p> <p>OSHA PEL 1989 (United States, 3/1989). CEIL: 229 mg/m³ CEIL: 200 ppm TWA: 40 mg/m³ 8 hour(s). TWA: 35 ppm 8 hour(s).</p>
ISO-BUTANE	75-28-5	0.1 - 3	<p>ACGIH TLV (United States, 2/2010). TWA: 1000 ppm 8 hour(s).</p>
Hydrogen Sulfide	7783-06-4	0.001 - 1	<p>ACGIH TLV (United States, 2/2010). STEL: 5 ppm 15 minute(s). TWA: 1 ppm 8 hour(s).</p> <p>NIOSH REL (United States, 6/2009). CEIL: 15 mg/m³ 10 minute(s). CEIL: 10 ppm 10 minute(s).</p> <p>OSHA PEL 1989 (United States, 3/1989). STEL: 21 mg/m³ 15 minute(s). STEL: 15 ppm 15 minute(s). TWA: 14 mg/m³ 8 hour(s). TWA: 10 ppm 8 hour(s).</p> <p>OSHA PEL Z2 (United States, 11/2006). AMP: 50 ppm 10 minute(s). CEIL: 20 ppm</p>

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Inhalation** : Call medical doctor or poison control center immediately. Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

- Flammability of the product** : Non-flammable.
- Auto-ignition temperature** : Lowest known value: 260°C (500°F) (hydrogen sulphide).
- Flash point** : Lowest known value: Closed cup: -188.15°C (-306.7°F). (ISO-BUTANE)
- Flammable limits** : Greatest known range: Lower: 12.5% Upper: 74.2% (carbon monoxide)
- Products of combustion** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
nitrogen oxides
sulfur oxides
- Fire-fighting media and instructions** : Use an extinguishing agent suitable for the surrounding fire.
- Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.
Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

- Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
- Methods for cleaning up** : Immediately contact emergency personnel. Stop leak if without risk. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

- Handling** : Use only with adequate ventilation. Wash thoroughly after handling. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Keep container closed. Avoid contact with skin and clothing. Avoid contact with eyes. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
- Storage** : Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

- Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Personal protection

- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
- Skin** : 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.
- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93

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- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
- Personal protection in case of a large spill** : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product. Full chemical-resistant suit and self-contained breathing apparatus should be worn only by trained and authorized persons.

Product name

nitrogen
oxygen
carbon monoxide

Oxygen Depletion [Asphyxiant]

ACGIH TLV (United States, 2/2010).

TWA: 29 mg/m³ 8 hour(s).

TWA: 25 ppm 8 hour(s).

NIOSH REL (United States, 6/2009).

CEIL: 229 mg/m³

CEIL: 200 ppm

TWA: 40 mg/m³ 10 hour(s).

TWA: 35 ppm 10 hour(s).

OSHA PEL (United States, 6/2010).

TWA: 55 mg/m³ 8 hour(s).

TWA: 50 ppm 8 hour(s).

OSHA PEL 1989 (United States, 3/1989).

CEIL: 229 mg/m³

CEIL: 200 ppm

TWA: 40 mg/m³ 8 hour(s).

TWA: 35 ppm 8 hour(s).

ISO-BUTANE

ACGIH TLV (United States, 2/2010).

TWA: 1000 ppm 8 hour(s).

hydrogen sulphide

ACGIH TLV (United States, 2/2010).

STEL: 5 ppm 15 minute(s).

TWA: 1 ppm 8 hour(s).

NIOSH REL (United States, 6/2009).

CEIL: 15 mg/m³ 10 minute(s).

CEIL: 10 ppm 10 minute(s).

OSHA PEL 1989 (United States, 3/1989).

STEL: 21 mg/m³ 15 minute(s).

STEL: 15 ppm 15 minute(s).

TWA: 14 mg/m³ 8 hour(s).

TWA: 10 ppm 8 hour(s).

OSHA PEL Z2 (United States, 11/2006).

AMP: 50 ppm 10 minute(s).

CEIL: 20 ppm

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

- Melting/freezing point** : -85.49°C (-121.9°F) This is based on data for the following ingredient: hydrogen sulphide. Weighted average: -209.48°C (-345.1°F)
- Critical temperature** : Lowest known value: -146.9°C (-232.4°F) (nitrogen).
- Vapor density** : Highest known value: 1.19 (Air = 1) (hydrogen sulphide). Weighted average: 0.98 (Air = 1)
- Gas Density (lb/ft³)** : Weighted average: 0.07

Section 10. Stability and reactivity

- Stability and reactivity** : The product is stable.
- Incompatibility with various substances** : Extremely reactive or incompatible with the following materials: reducing materials and combustible materials.
- Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
- Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Product/ingredient name	Result	Species	Dose	Exposure	
carbon monoxide	TDL _o Intraperitoneal	Rat	35 mL/kg	-	
	LC50 Inhalation Vapor	Rat	13500 mg/m ³	15 minutes	
	LC50 Inhalation Vapor	Rat	1900 mg/m ³	4 hours	
	LC50 Inhalation Gas.	Rat	6600 ppm	30 minutes	
	LC50 Inhalation Gas.	Rat	3760 ppm	1 hours	
	LC50 Inhalation Gas.	Mouse	2444 ppm	4 hours	
	LC50 Inhalation Gas.	Rat	1807 ppm	4 hours	
	hydrogen sulphide	LC50 Inhalation Vapor	Rat	820 mg/m ³	3 hours
		LC50 Inhalation Vapor	Rat	700 mg/m ³	4 hours
		LC50 Inhalation Vapor	Rat	470 mg/m ³	6 hours
LC50 Inhalation Gas.		Rat	712 ppm	1 hours	
LC50 Inhalation Gas.		Mouse	634 ppm	1 hours	
LC50 Inhalation Gas.		Rat	444 ppm	4 hours	

Chronic effects on humans : Contains material which may cause damage to the following organs: blood, lungs, the nervous system, heart, cardiovascular system, upper respiratory tract, eyes, central nervous system (CNS).

Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects : No known significant effects or critical hazards.

Mutagenic effects : No known significant effects or critical hazards.

Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Product/ingredient name	Test	Result	Species	Exposure
hydrogen sulphide	-	Acute EC50 770 ug/L Fresh water	Crustaceans - Amphipod - Crangonyx richmondensis ssp. lauren - 10 mm	48 hours
	-	Acute EC50 540 ug/L Fresh water	Crustaceans - Amphipod - Crangonyx richmondensis ssp. lauren - 10 mm	48 hours
	-	Acute EC50 95 ug/L Fresh water	Crustaceans - Scud - Gammarus pseudolimnaeus - 11 mm	2 days
	-	Acute EC50 71 ug/L	Crustaceans -	2 days

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	Fresh water	Scud - Gammarus pseudolimnaeus - 11 mm	
-	Acute EC50 62 ug/L Fresh water	Crustaceans - Scud - Gammarus pseudolimnaeus - 11 mm	2 days
-	Acute LC50 7 ug/L Fresh water	Fish - Fathead minnow - Pimephales promelas - Fry	96 hours
-	Acute LC50 4 ug/L Fresh water	Fish - Lake whitefish - Coregonus clupeaformis - Yolk-sac fry	96 hours
-	Acute LC50 3.2 ug/L Fresh water	Fish - Asian redbtail catfish - Hemibagrus nemurus	96 hours
-	Acute LC50 3 ug/L Fresh water	Fish - Lake whitefish - Coregonus clupeaformis - Yolk-sac fry	96 hours
-	Acute LC50 2 ug/L Fresh water	Fish - Lake whitefish - Coregonus clupeaformis - Yolk-sac fry	96 hours
-	Acute LC50 <2 ug/L Fresh water	Fish - Yellow perch - Perca flavescens - Yolk-sac fry	96 hours

- Products of degradation** : Products of degradation: carbon oxides (CO, CO₂) and water, nitrogen oxides (NO, NO₂ etc.), sulfur oxides (SO₂, SO₃ etc.).
- Environmental fate** : Not available.
- Environmental hazards** : No known significant effects or critical hazards.
- Toxicity to the environment** : Not available.



Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Chemtron, Inc. Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1956	COMPRESSED GAS, N.O.S.	2.2	Not applicable (gas).		-

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TDG Classification	UN1956	COMPRESSED GAS, N.O.S.	2.2	Not applicable (gas).		Explosive Limit and Limited Quantity Index 0.125 Passenger Carrying Road or Rail Index 75
Mexico Classification	UN1956	COMPRESSED GAS, N.O.S.	2.2	Not applicable (gas).		-

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Section 15. Regulatory information

United States

- U.S. Federal regulations** : TSCA 8(a) IUR: Not determined
- United States inventory (TSCA 8b)**: All components are listed or exempted.
- SARA 302/304/311/312 extremely hazardous substances**: hydrogen sulphide
- SARA 302/304 emergency planning and notification**: hydrogen sulphide
- SARA 302/304/311/312 hazardous chemicals**: nitrogen; oxygen; ISO-BUTANE; carbon monoxide; hydrogen sulphide
- SARA 311/312 MSDS distribution - chemical inventory - hazard identification**: nitrogen: Sudden release of pressure; oxygen: Fire hazard, Sudden release of pressure, Delayed (chronic) health hazard; ISO-BUTANE: Fire hazard, Sudden release of pressure; carbon monoxide: Fire hazard, Sudden release of pressure, Immediate (acute) health hazard, Delayed (chronic) health hazard; hydrogen sulphide: Fire hazard, Sudden release of pressure, Immediate (acute) health hazard, Delayed (chronic) health hazard
- Clean Air Act (CAA) 112 accidental release prevention - Flammable Substances**: ISO-BUTANE
- Clean Air Act (CAA) 112 accidental release prevention - Toxic Substances**: Hydrogen Sulfide
- Clean Air Act (CAA) 112 regulated flammable substances**: ISO-BUTANE
- Clean Air Act (CAA) 112 regulated toxic substances**: hydrogen sulphide

SARA 313

	<u>Product name</u>	<u>CAS number</u>	<u>Concentration</u>
Form R - Reporting requirements	: Hydrogen Sulfide	7783-06-4	0.001 - 1
Supplier notification	: Hydrogen Sulfide	7783-06-4	0.001 - 1

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

State regulations

- : **Connecticut Carcinogen Reporting:** None of the components are listed.
- Connecticut Hazardous Material Survey:** None of the components are listed.
- Florida substances:** None of the components are listed.
- Illinois Chemical Safety Act:** None of the components are listed.
- Illinois Toxic Substances Disclosure to Employee Act:** None of the components are listed.
- Louisiana Reporting:** None of the components are listed.
- Louisiana Spill:** None of the components are listed.
- Massachusetts Spill:** None of the components are listed.
- Massachusetts Substances:** The following components are listed: NITROGEN; OXYGEN (LIQUID); CARBON MONOXIDE; ISO-BUTANE; HYDROGEN SULFIDE

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Michigan Critical Material: None of the components are listed.
Minnesota Hazardous Substances: None of the components are listed.
New Jersey Hazardous Substances: The following components are listed: NITROGEN; OXYGEN; CARBON MONOXIDE; ISO-BUTANE; HYDROGEN SULFIDE
New Jersey Spill: None of the components are listed.
New Jersey Toxic Catastrophe Prevention Act: The following components are listed: carbon monoxide; Hydrogen Sulfide
New York Acutely Hazardous Substances: The following components are listed: Hydrogen sulfide
New York Toxic Chemical Release Reporting: None of the components are listed.
Pennsylvania RTK Hazardous Substances: The following components are listed: NITROGEN; OXYGEN; CARBON MONOXIDE; ISO-BUTANE; HYDROGEN SULFIDE (H2S)
Rhode Island Hazardous Substances: None of the components are listed.

California Prop. 65 : **WARNING:** This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

<u>Ingredient name</u>	<u>Cancer</u>	<u>Reproductive</u>	<u>No significant risk level</u>	<u>Maximum acceptable dosage level</u>
Carbon Monoxide	No.	Yes.	No.	No.

Canada
WHMIS (Canada) : Class A: Compressed gas.
 Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
 Class D-2A: Material causing other toxic effects (Very toxic).
 Class D-2B: Material causing other toxic effects (Toxic).
CEPA Toxic substances: The following components are listed: ISO-BUTANE
Canadian ARET: None of the components are listed.
Canadian NPRI: The following components are listed: Carbon monoxide; Volatile organic compounds; Hydrogen sulphide
Alberta Designated Substances: None of the components are listed.
Ontario Designated Substances: None of the components are listed.
Quebec Designated Substances: None of the components are listed.

Section 16. Other information

United States
Label requirements : MAY BE FATAL IF INHALED.
 MAY CAUSE EYE AND SKIN IRRITATION.
 CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
 CONTENTS UNDER PRESSURE.

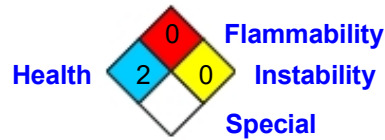
Canada
Label requirements : Class A: Compressed gas.
 Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
 Class D-2A: Material causing other toxic effects (Very toxic).
 Class D-2B: Material causing other toxic effects (Toxic).

Hazardous Material Information System (U.S.A.) :

Health	*	2
Flammability		0
Physical hazards		0

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National Fire Protection Association (U.S.A.) :



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.