

Material Safety Data Sheet



Flammable Gas Mixture: 1 Butene / 1 Hexene / Cis-2-Butene / Cis-2-Hexene / Ethane / Ethylene / Hexane / N Butane / Nitrogen / Trans-2-Butene / Trans-2-Hexene

Section 1. Chemical product and company identification

Product name	: Flammable Gas Mixture: 1 Butene / 1 Hexene / Cis-2-Butene / Cis-2-Hexene / Ethane / Ethylene / Hexane / N Butane / Nitrogen / Trans-2-Butene / Trans-2-Hexene
Supplier	: AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
Product use	: Synthetic/Analytical chemistry.
MSDS #	: 008634
Date of Preparation/Revision	: 4/6/2009.
In case of emergency	: 1-866-734-3438

Section 2. Hazards identification

Physical state	: Gas. DANGER! FLAMMABLE GAS. MAY CAUSE FLASH FIRE. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CONTENTS UNDER PRESSURE. Keep away from heat, sparks and flame. Do not puncture or incinerate container. Contains material that may cause target organ damage, based on animal data. Use only with adequate ventilation. Keep container closed. Contact with rapidly expanding gases can cause frostbite.
Target organs	: Contains material which may cause damage to the following organs: mucous membranes, heart, peripheral nervous system, upper respiratory tract, skin, eyes, central nervous system (CNS), muscle tissue.
Routes of entry	: Inhalation Dermal Eyes
Potential acute health effects	
Eyes	: Slightly irritating to the eyes. Contact with rapidly expanding gas may cause burns or frostbite.
Skin	: Slightly irritating to the skin. Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	: Slightly irritating to the respiratory system.
Ingestion	: Ingestion is not a normal route of exposure for gases
Potential chronic health effects	: CARCINOGENIC EFFECTS: Classified A4 (Not classifiable for humans or animals.) by ACGIH, 3 (Not classifiable for humans.) by IARC [ethylene]. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available.
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	50 - 99	Oxygen Depletion [Asphyxiant]
1-Butene	106-98-9	0.25 - 5	ACGIH TLV (United States, 1/2008). TWA: 250 ppm 8 hour(s).
1-Hexene	592-41-6	0.5 - 5	ACGIH TLV (United States, 1/2008). TWA: 50 ppm 8 hour(s).
Cis-2-Butene	590-18-1	0.25 - 5	ACGIH TLV (United States, 1/2008). TWA: 250 ppm 8 hour(s).
Cis-2-Hexene	7688-21-3	0.5 - 5	
Ethane	74-84-0	0.25 - 5	ACGIH TLV (United States, 1/2008). TWA: 1000 ppm 8 hour(s).
Ethylene	74-85-1	0.5 - 5	ACGIH TLV (United States, 1/2008). TWA: 200 ppm 8 hour(s).
Hexane	110-54-3	0.5 - 5	ACGIH TLV (United States, 1/2008). Absorbed through skin. TWA: 50 ppm 8 hour(s). NIOSH REL (United States, 6/2008). TWA: 180 mg/m ³ 10 hour(s). TWA: 50 ppm 10 hour(s). OSHA PEL (United States, 11/2006). TWA: 1800 mg/m ³ 8 hour(s). TWA: 500 ppm 8 hour(s). OSHA PEL 1989 (United States, 3/1989). TWA: 180 mg/m ³ 8 hour(s). TWA: 50 ppm 8 hour(s).
N-Butane	106-97-8	0.25 - 5	ACGIH TLV (United States, 1/2008). TWA: 1000 ppm 8 hour(s). NIOSH REL (United States, 6/2008). TWA: 1900 mg/m ³ 10 hour(s). TWA: 800 ppm 10 hour(s). OSHA PEL 1989 (United States, 3/1989). TWA: 1900 mg/m ³ 8 hour(s). TWA: 800 ppm 8 hour(s).
Trans-2-Butene	624-64-6	0.25 - 5	ACGIH TLV (United States, 1/2008). TWA: 250 ppm 8 hour(s).
Trans-2-Hexene	4050-45-7	0.25 - 5	

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** : 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.

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Section 5. Fire-fighting measures

- Flammability of the product** : Flammable.
- Auto-ignition temperature** : Lowest known value: 286.85°C (548.3°F) (butane).
- Flash point** : Lowest known value: Closed cup: -135.85°C (-212.5°F). (ethylene)
- Flammable limits** : Greatest known range: Lower: 2.7% Upper: 36% (ethylene)
- Products of combustion** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
nitrogen oxides

- Fire-fighting media and instructions** : In case of fire, use water spray (fog), foam or dry chemical.

In case of fire, allow gas to burn if flow cannot be shut off immediately. 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. Extremely flammable. In a fire or if heated, a pressure increase will occur and the container may burst or explode. Gas may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back, causing fire or explosion.

- 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. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. 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. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
- Storage** : Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. 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. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

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.

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- 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
- 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.

Product name

nitrogen	Oxygen Depletion [Asphyxiant]
but-1-ene	ACGIH TLV (United States, 1/2008). TWA: 250 ppm 8 hour(s).
hex-1-ene	ACGIH TLV (United States, 1/2008). TWA: 50 ppm 8 hour(s).
(Z)-but-2-ene	ACGIH TLV (United States, 1/2008). TWA: 250 ppm 8 hour(s).
2-hexene-cis ethane	ACGIH TLV (United States, 1/2008). TWA: 1000 ppm 8 hour(s).
ethylene	ACGIH TLV (United States, 1/2008). TWA: 200 ppm 8 hour(s).
n-hexane	ACGIH TLV (United States, 1/2008). Absorbed through skin. TWA: 50 ppm 8 hour(s). NIOSH REL (United States, 6/2008). TWA: 180 mg/m ³ 10 hour(s). TWA: 50 ppm 10 hour(s). OSHA PEL (United States, 11/2006). TWA: 1800 mg/m ³ 8 hour(s). TWA: 500 ppm 8 hour(s). OSHA PEL 1989 (United States, 3/1989). TWA: 180 mg/m ³ 8 hour(s). TWA: 50 ppm 8 hour(s).
butane	ACGIH TLV (United States, 1/2008). TWA: 1000 ppm 8 hour(s). NIOSH REL (United States, 6/2008). TWA: 1900 mg/m ³ 10 hour(s). TWA: 800 ppm 10 hour(s). OSHA PEL 1989 (United States, 3/1989). TWA: 1900 mg/m ³ 8 hour(s). TWA: 800 ppm 8 hour(s).
(E)-but-2-ene	ACGIH TLV (United States, 1/2008). TWA: 250 ppm 8 hour(s).

trans-hex-2-ene

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

- Melting/freezing point** : -105°C (-157°F) This is based on data for the following ingredient: (E)-but-2-ene. Weighted average: -196.27°C (-321.3°F)
- Critical temperature** : Lowest known value: -146.9°C (-232.4°F) (nitrogen).
- Vapor density** : Highest known value: 2 (Air = 1) (butane). Weighted average: 1.12 (Air = 1)
- Gas Density (lb/ft³)** : Weighted average: 0.09

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Section 10. Stability and reactivity

- Stability and reactivity** : The product is stable.
- Incompatibility with various substances** : Extremely reactive or incompatible with the following materials: oxidizing 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
hex-1-ene	LD Dermal	Rabbit	>10 g/kg	-
	LD Oral	Rat	>10 g/kg	-
	LC50 Inhalation Gas.	Rat	32000 ppm	4 hours
n-hexane	LD50 Oral	Rat	25 g/kg	-
	LDLo Intraperitoneal	Rat	9100 mg/kg	-
	TDLo Oral	Rat	20000 mg/kg	-
	LC50 Inhalation Vapor	Rat	627000 mg/m3	3 minutes
	LC50 Inhalation Gas.	Rat	48000 ppm	4 hours
butane	LC50 Inhalation Vapor	Rat	658 g/m3	4 hours

- Chronic effects on humans** : **CARCINOGENIC EFFECTS:** Classified A4 (Not classifiable for humans or animals.) by ACGIH, 3 (Not classifiable for humans.) by IARC [ethylene]. Contains material which may cause damage to the following organs: mucous membranes, heart, peripheral nervous system, upper respiratory tract, skin, eyes, central nervous system (CNS), muscle tissue.

- 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
n-hexane	-	Acute LC50 113000 ug/L Fresh water	Fish - Mozambique tilapia - Tilapia mossambica - 99 mm - 10 g	96 hours
	-	Acute LC50 2500 to 2980 ug/L Fresh water	Fish - Fathead minnow - Pimephales promelas - 31 days - 20.4 mm - 0.123 g	96 hours




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

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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 Airgas, 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	UN1954	COMPRESSED GAS, FLAMMABLE, N.O.S.	2.1	Not applicable (gas).		-
TDG Classification	UN1954	COMPRESSED GAS, FLAMMABLE, N.O.S.	2.1	Not applicable (gas).		<p>Explosive Limit and Limited Quantity Index 0.125</p> <p>ERAP Index 3000</p> <p>Passenger Carrying Ship Index Forbidden</p> <p>Passenger Carrying Road or Rail Index Forbidden</p>
Mexico Classification	UN1954	COMPRESSED GAS, FLAMMABLE, N.O.S.	2.1	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 4(a) final test rules: n-hexane
United States inventory (TSCA 8b): Not determined.
TSCA 12(b) annual export notification: n-hexane
- SARA 302/304/311/312 extremely hazardous substances**: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: hex-1-ene; ethane; ethylene; n-hexane; butane; nitrogen
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: hex-1-ene: Fire hazard, Immediate (acute) health hazard; ethane: Fire hazard, Sudden release of pressure, Immediate (acute) health hazard; ethylene: Fire hazard, reactive, Sudden release of pressure, Delayed (chronic) health hazard; n-hexane: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard; butane: Fire hazard, Sudden release of pressure; nitrogen: Sudden release of pressure
- Clean Water Act (CWA) 307**: No products were found.
Clean Water Act (CWA) 311: No products were found.

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Clean Air Act (CAA) 112 accidental release prevention: but-1-ene; (Z)-but-2-ene; ethane; ethylene; butane; (E)-but-2-ene

Clean Air Act (CAA) 112 regulated flammable substances: but-1-ene; (Z)-but-2-ene; ethane; ethylene; butane; (E)-but-2-ene

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

SARA 313

	<u>Product name</u>	<u>CAS number</u>	<u>Concentration</u>
Form R - Reporting requirements	: Ethylene	74-85-1	0.5 - 5
	: Hexane	110-54-3	0.5 - 5
Supplier notification	: Ethylene	74-85-1	0.5 - 5
	: Hexane	110-54-3	0.5 - 5

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; 1-BUTENE; 1-HEXENE; 2-BUTENE-CIS; 2-HEXENE-CIS; ETHANE; ETHYLENE; HEXANE; BUTANE; 2-BUTENE-TRANS
- 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 (COMPRESSED OR LIQUIFIED); 1-HEXENE; ETHANE; ETHYLENE; n-HEXANE; BUTANE
- New Jersey Spill:** None of the components are listed.
- New Jersey Toxic Catastrophe Prevention Act:** None of the components are listed.
- New York Acutely Hazardous Substances:** The following components are listed: Hexane
- New York Toxic Chemical Release Reporting:** None of the components are listed.
- Pennsylvania RTK Hazardous Substances:** The following components are listed: NITROGEN; 1-BUTENE; 1-HEXENE; 2-BUTENE, (Z)-; ETHANE; ETHENE; HEXANE; BUTANE; 2-BUTENE, (E)-
- Rhode Island Hazardous Substances:** None of the components are listed.

Canada

WHMIS (Canada)

- : Class A: Compressed gas.
- : Class B-1: Flammable gas.
- : 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: Volatile organic compounds
- Canadian ARET:** None of the components are listed.
- Canadian NPRI:** The following components are listed: Butene; Hexene; Butene; Volatile organic compounds; Ethylene; n-Hexane; Butane; Butene
- 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

: FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
CONTENTS UNDER PRESSURE.

Canada

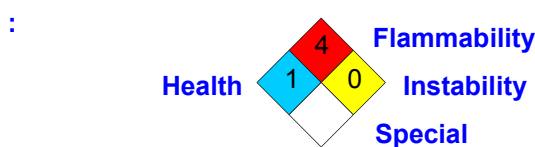
Label requirements

: Class A: Compressed gas.
Class B-1: Flammable gas.
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	*	1
Flammability		4
Physical hazards		0

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.