

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

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|---|---|
| Product Name: Compressed gases, n.o.s. (nitrogen, carbon dioxide) (MSDS No. P-6221-A) | Trade Name: BAR Mixtures |
| Chemical Name: Mixtures of nitrogen and nitric oxide— may also contain carbon dioxide, carbon monoxide, and propane. | Synonyms: Not applicable |
| Formula: Mixtures of N ₂ , & NO—may also contain CO ₂ , CO, & C ₃ H ₈ . | Chemical Family: Not applicable |
| Telephone: Emergencies: 1-800-645-4633* CHEMTREC: 1-800-424-9300* Routine: 1-800-PRAXAIR | Company Name: Praxair, Inc. 39 Old Ridgebury Road Danbury, CT 06810-5113 |

* Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).

2. Composition/Information on Ingredients

This section covers materials of manufacture only. For custom mixtures of this product, request an MSDS for each component. See section 16 for important information about mixtures.

| INGREDIENT | CAS NUMBER | CONCENTRATION | OSHA PEL | ACGIH TLV-TWA (1999) |
|-----------------|------------|---------------|----------|----------------------|
| Nitric Oxide* | 10102-43-9 | 300-3000 ppm | 25 ppm | 25 ppm |
| Propane | 74-98-6 | 0-3200 ppm | 1000 ppm | 2500 ppm |
| Carbon Monoxide | 630-08-0 | 0-8% | 50 ppm | 25 ppm |
| Carbon Dioxide | 124-38-9 | 0-14% | 5000 ppm | 5000 ppm** |
| Nitrogen | 7727-37-9 | Balance | NCE*** | SA*** |

*Nitrogen Dioxide is present at less than (<) 30 ppm as an impurity. **See section 3.

***NCE = None currently established; SA = Simple asphyxiant.

3. Hazards Identification

EMERGENCY OVERVIEW

**WARNING! Toxic high-pressure gas. Contains nitric oxide.
 Harmful if inhaled. Causes eye and skin burns.
 Can cause rapid suffocation. May cause dizziness and drowsiness.
 May increase respiration and heart rate.
 May cause red blood cell and nervous system damage.
 Symptoms may be delayed.
 Self-contained breathing apparatus may be required by rescue workers.
 Odor: Unknown**

THRESHOLD LIMIT VALUE: TLV-TWA, 25 ppm, carbon monoxide, nitric oxide. TLV-TWA, 5000 ppm, carbon dioxide; 30,000 ppm, 15 min STEL (ACGIH, 1999). The potential impurity, nitrogen dioxide, has a TLV-TWA of 3 ppm and a TLV (ceiling) of 5 ppm (ACGIH 1999). TLV ceiling values are not time-weighted average. TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations.

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

INHALATION—This mixture is an asphyxiant with effects due to lack of oxygen. Lack of oxygen can kill. Depending on the concentration and duration of exposure, the nitric oxide (NO) component, which readily converts to nitrogen dioxide (NO₂) in air, may irritate mucous membranes, sinuses, pharynx, and bronchia, causing pain, headache, cyanosis, irregular respiration, choking, dizziness, and possibly pulmonary edema (fluid in the lungs). Often there are no pulmonary symptoms at time of exposure, but symptoms may appear within 5 to 72 hours. Also depending on the concentration and duration of exposure, the carbon monoxide (CO) component may cause pallor, cyanosis, nausea, hallucinations, confusion, angina, and convulsions. With well-established CO poisoning, the mucosal surface will be bright red (cherry red). The carbon dioxide (CO₂) component is physiologically active, affecting circulation and breathing. Moderate concentrations may cause headache, drowsiness, dizziness, stinging of the nose and throat, excitation, rapid breathing and heart rate, excess salivation, vomiting, and unconsciousness.

SKIN CONTACT—The NO component is a severe irritant that can cause burns..

SWALLOWING—A highly unlikely route of exposure. This product is a gas at normal temperature and pressure.

EYE CONTACT—The NO component may cause severe conjunctivitis, producing marked redness and swelling of the conjunctiva. May cause corneal injury with opacification.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE: Repeated hypoxia from CO exposure will cause gradually increasing central nervous system (CNS) damage, with loss of sensation in the fingers, poor memory, and mental deterioration. Chronic exposure may facilitate development of atherosclerosis. Repeated inflammation due to the NO component may cause bronchitis or emphysema. Repeated skin contact may produce cumulative dermatitis.

OTHER EFFECTS OF OVEREXPOSURE: Other effects of exposure to CO include embryotoxicity, impaired cardiovascular function, pulmonary edema, pneumonia, gross neuropsychiatric damage, memory impairment, permanent CNS damage, and cerebral edema with irreversible brain damage. Late, fatal demyelination is a rare, but possible, complication. With inhalation, the CO component may aggravate asthma and inflammatory or fibrotic pulmonary disease. The skin irritating properties of NO may aggravate dermatitis.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: Hypoxia from carboxy-hemoglobin formation due to the CO component may aggravate established coronary and cerebral circulatory insufficiency.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION: CO produces embryofetal toxicity in laboratory animals, but only at doses that cause maternal toxicity. There is no information available on possible effects in humans.

A single study has shown an increase in heart defects in rats exposed to 6% carbon dioxide in air for 24 hours at different times during gestation. There is no evidence that carbon dioxide is teratogenic in humans.

NO has been shown to cause mutations in bacteria, and to cause mutations, sister-chromatid exchanges, and chromosomal aberrations in mammalian cells. Although not demonstrated with NO, repeated or prolonged maternal hypoxia induced by overexposure to other chemical asphyxiants has produced embryofetal toxicity in laboratory animals.

CARCINOGENICITY: None of the components of this mixture is listed by NTP, OSHA, or IARC.

4. First Aid Measures

NOTE: *In case of contact or suspicion of contact with nitric oxide, prompt medical attention is absolutely necessary.*

INHALATION: Immediately remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician.

SKIN CONTACT: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Discard clothing and shoes. Call a physician.

SWALLOWING: An unlikely route of exposure. This product is a gas at normal temperature and pressure.

EYE CONTACT: Immediately flush eyes with cool water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. See a physician, preferably an ophthalmologist, immediately.

NOTES TO PHYSICIAN: *In case of overexposure, keep patient under medical observation for at least 72 hours to observe for pulmonary edema. Patient may have second acute pulmonary reaction 2-6 weeks after the first one. The hazards of the NO component are mainly due to its severe irritant and corrosive properties on the skin and mucosal surfaces. Angina and depression of the ST segment of the electrocardiogram indicates myocardial hypoxia due to the CO component. Exposure to high concentrations of CO can result in cerebral edema. With severe CO doses, the use of hyperbaric oxygen may be beneficial. Individuals repeatedly overexposed to CO may present positive Romberg's sign. There is no specific antidote, and treatment should be directed at the control of the symptoms and the clinical condition.*

5. Fire Fighting Measures

| | | |
|---|------------------------------|------------------------------|
| FLASH POINT (test method): | Not applicable | |
| AUTOIGNITION TEMPERATURE: | Not applicable | |
| FLAMMABLE LIMITS IN AIR , % by volume: | LOWER: Not applicable | UPPER: Not applicable |
| EXTINGUISHING MEDIA: This mixture cannot catch fire. Use media appropriate for surrounding fire. | | |

SPECIAL FIRE FIGHTING PROCEDURES: WARNING! Toxic high-pressure gas. Contains nitric oxide. Asphyxiant; harmful if inhaled or absorbed by the skin. Evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Immediately deluge cylinders with water from maximum distance until cool, then move them away from fire area if without risk. If cylinders are leaking, reduce toxic vapors with water spray or fog. Shut off leak if without risk. Reverse flow into cylinders may cause rupture. (See section 16.) On-site fire brigades must comply with OSHA 29 CFR 1910.156.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Heat of fire can build pressure in cylinder and cause it to rupture. No part of cylinder should be subjected to a temperature higher than 125°F (52°C). Cylinders containing this mixture are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.)

HAZARDOUS COMBUSTION PRODUCTS: See section 10.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: WARNING! Toxic high-pressure gas. Contains nitric oxide. Asphyxiant; harmful if inhaled or absorbed by the skin.

Immediately evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Contact with flammables may cause fire or explosion. Reverse flow into cylinder may cause rupture. (See section 16.) Reduce vapors with fog or fine water spray. Shut off flow if without risk. Ventilate area or move cylinder to a well-ventilated area. Toxic, corrosive vapors may spread from spill. Before entering area, especially a confined area, check atmosphere with an appropriate device.

WASTE DISPOSAL METHOD: Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN STORAGE: Store and use with adequate ventilation, away from oil, grease, and other flammable materials. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Store only where temperature will not exceed 125°F (52°C). Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods. Visually inspect stored cylinders at least once a week for indications of leaks or other problems.

PRECAUTIONS TO BE TAKEN IN HANDLING: Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. For other precautions in using BAR mixtures, see section 16.

For additional information on storage and handling, refer to Compressed Gas Association (CGA) pamphlet P-1, *Safe Handling of Compressed Gases in Containers*, available from the CGA. Refer to section 16 for the address and phone number along with a list of other available publications.

8. Exposure Controls/Personal Protection

VENTILATION/ENGINEERING CONTROLS:

LOCAL EXHAUST—A corrosion-resistant system is acceptable. (See SPECIAL.)

MECHANICAL (general)—Inadequate; see SPECIAL, below.

SPECIAL—Use only in a closed system. Corrosion-resistant, forced-draft fume hood is preferred

OTHER—See SPECIAL.

RESPIRATORY PROTECTION: Select per OSHA 29 CFR 1910.134 and ANSI Z88.2. Use any NIOSH/MSHA-approved air-supplied respirator for concentrations up to 10 times the applicable permissible exposure limit. For concentrations from 10 to 100 times the PEL, use the above respirator fitted with a full facepiece, or use a self-contained breathing apparatus. For higher concentrations, a full-face, self-contained breathing apparatus operated in the pressure demand mode is required.

PROTECTIVE GLOVES: Wear work gloves for cylinder handling; butyl rubber or polyvinyl chloride when changing out cylinders or wherever contact with product is possible.

EYE PROTECTION: Wear safety glasses when handling cylinders; vapor-proof goggles and a face shield during cylinder changeout or wherever contact with product is possible. Select per OSHA 29 CFR 1910.133.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling and protective clothing where needed. Select per OSHA 29 CFR 1910.132 and 1910.133. Regardless of protective equipment, never touch live electrical parts.

9. Physical and Chemical Properties

SPECIFIC GRAVITY (Air = 1) at 70°F (21.1°C) and 1 atm: 0.967 to 1.047 (calculated)

SOLUBILITY IN WATER: Slight

PERCENT VOLATILES BY VOLUME: 100

APPEARANCE, ODOR, AND STATE: Colorless gas at normal temperature and pressure; odor unknown.

10. Stability and Reactivity

STABILITY: Unstable Stable

INCOMPATIBILITY (materials to avoid): Contains nitric oxide, which reacts with air, oxygen, ozone, oxidizing agents, flammable materials, combustible materials; powdered aluminum, boron, chlorine monoxide, chromium, fluorine, nitrogen trichloride, halogens, iron, sodium monoxide, magnesium, manganese, phosphorus, tungsten carbide, and uranium. Additional reactions from other components are possible with alkali metals, alkaline earth metals, aluminum, ammonia, chromium, halogens, metal acetylides; nitric acid, potassium, magnesium above 1427°F (775°C), and titanium above 1022°F (550°C).

HAZARDOUS DECOMPOSITION PRODUCTS: The CO component will decompose above 752°F (400°C) to form CO₂ and carbon. Thermal decomposition or burning of NO will produce highly toxic fumes of nitrogen oxides; of C₃H₈ will produce CO and CO₂. Electrical discharges and high temperatures decompose CO₂ into CO and O₂.

HAZARDOUS POLYMERIZATION: May Occur Will Not Occur

CONDITIONS TO AVOID: Exposure to light or heat in the presence of moisture. CO will decompose above 752°F (400°C) to form CO₂ and carbon. Nitric oxide is thermodynamically unstable at room temperature, slowly undergoing disproportionation: $4\text{NO} \rightarrow \text{N}_2\text{O}_3 + \text{N}_2\text{O}$.

11. Toxicological Information

Carbon dioxide is an asphyxiant. It initially stimulates respiration and then causes respiratory depression. High concentrations result in narcosis. Symptoms in humans are as follows:

| EFFECT: | CONCENTRATION: |
|---|----------------|
| Breathing rate increases slightly. | 1% |
| Breathing rate increases to 50% above normal level. Prolonged exposure can cause headache, tiredness. | 2% |
| Breathing increases to twice normal rate and becomes labored. Weak narcotic effect. Impaired hearing, headache, increased blood pressure and pulse rate. | 3% |
| Breathing increases to approximately four times normal rate, symptoms of intoxication become evident, and slight choking may be felt. | 4 - 5% |
| Characteristic sharp odor noticeable. Very labored breathing, headache, visual impairment, and ringing in the ears. Judgment may be impaired, followed within minutes by loss of consciousness. | 5 - 10% |
| Unconsciousness occurs more rapidly above 10% level. Prolonged exposure to high concentrations may eventually result in death from asphyxiation. | 50 - 100% |

For toxic effects of other components, see section 3.

12. Ecological Information

No adverse ecological effects expected. BAR Mixtures do not contain any Class I or Class II ozone-depleting chemicals. None of the mixture components is listed as a marine pollutant by DOT.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Keep waste from contaminating surrounding environment. Keep personnel away. Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

DOT/IMO SHIPPING NAME: Compressed gases, n.o.s. (nitrogen, carbon dioxide)

| | | |
|--------------------------|---------------------------------------|--|
| HAZARD CLASS: 2.2 | IDENTIFICATION NUMBER: UN 1956 | PRODUCT RQ: 10 lb (4.54 kg), nitric oxide, nitrogen dioxide |
|--------------------------|---------------------------------------|--|

SHIPPING LABEL(s): NONFLAMMABLE GAS

PLACARD (when required): NONFLAMMABLE GAS

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of a vehicle can present serious safety hazards.

Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

U.S. FEDERAL REGULATIONS:

EPA (ENVIRONMENTAL PROTECTION AGENCY)

CERCLA: COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR Parts 117 and 302):

Reportable Quantity (RQ): 10 lb (4.54 kg), NO, N₂O

SARA: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT:

SECTIONS 302/304: Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of extremely hazardous substances (40 CFR Part 355):

Threshold Planning Quantity (TPQ): 100 lb (45.4 kg), NO, N₂O

Extremely Hazardous Substances (40 CFR 355): None

SECTIONS 311/312: Require submission of MSDSs and reporting of chemical inventories with identification of EPA hazard categories. The hazard categories for this product are as follows:

IMMEDIATE: Yes

PRESSURE: Yes

DELAYED: Yes

REACTIVITY: Yes

FIRE: No

SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

None of the components of this mixture requires reporting under Section 313.

40 CFR 68: RISK MANAGEMENT PROGRAM FOR CHEMICAL ACCIDENTAL RELEASE PREVENTION: Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

The propane (C₂H₆) and NO components of this mixture are listed as regulated substances in quantities of 10,000 lb (4536 kg) or greater.

TSCA: TOXIC SUBSTANCES CONTROL ACT: The components of this mixture are listed on the TSCA inventory.

OSHA: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:

29 CFR 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS: Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

The NO component and the NO₂ impurity in this mixture are listed in Appendix A as highly hazardous chemicals in quantities of 250 lb (113.4 kg) or greater.

STATE REGULATIONS:

CALIFORNIA: The CO component of this mixture is listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

WARNING: Carbon monoxide is a chemical known to the State of California to cause birth defects or other reproductive harm.

(California Health and Safety Code §25249.5 et seq.)

PENNSYLVANIA: The components of this mixture are subject to the PENNSYLVANIA WORKER AND COMMUNITY RIGHT-TO-KNOW ACT (35 P.S. Sections 7301-7320).

16. Other Information

Be sure to read and understand all labels and instructions supplied with all containers of this product.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE: **Toxic high-pressure gas. Contains nitric oxide. Asphyxiant; harmful if inhaled or absorbed by the skin.** May be fatal if inhaled. Do not breathe gas. Do not get vapors or liquid in eyes, on skin, or on clothing. (See section 3.) Have safety showers and eyewash fountains immediately available. ***Use piping and equipment adequately designed to withstand pressures to be encountered.*** Use only in a closed system constructed of corrosion-resistant materials. ***Prevent reverse flow.*** Reverse flow into cylinder may cause rupture. Use a check valve or other protective device in any line or piping from the cylinder. ***Store and use with adequate ventilation at all times.*** Close valve after each use; keep closed even when empty. ***Never work on a pressurized system.*** If there is a leak, close the cylinder valve. Blow the system down in an environmentally safe manner in compliance with all federal, state, and local laws, inert the system, then repair the leak. ***Never allow a compressed gas cylinder to become part of an electrical circuit.***

NOTE: *Prior to using any plastics, confirm their compatibility with the components of this mixture. Also be aware that corrosion of pure nickel in atmospheres of pure CO exceeds 50 mil/yr (1.27 mm/yr) at room temperatures.*

MIXTURES: When you mix two or more gases or liquefied gases, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Remember, gases and liquids have properties that can cause serious injury or death.

HAZARD RATING SYSTEMS:**NFPA RATINGS:**

HEALTH = 3
 FLAMMABILITY = 0
 REACTIVITY = 0
 SPECIAL = None

HMIS RATINGS:

HEALTH = 1
 FLAMMABILITY = 0
 REACTIVITY = 0

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED: 0-3000 psig CGA-660
PIN-INDEXED YOKE: Not applicable
ULTRA-HIGH-INTEGRITY CONNECTION: Not applicable

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlets V-1 and V-7 listed below.

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information about this product can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 1725 Jefferson Davis Highway, Arlington, VA 22202-4102, Telephone (703) 412-0900.

AV-1 *Safe Handling and Storage of Compressed Gases*
 P-1 *Safe Handling of Compressed Gases in Containers*
 P-9 *Inert Gases—Argon, Nitrogen, and Helium*
 P-14 *Accident Prevention in Oxygen-Rich, Oxygen-Deficient Atmospheres*
 SB-2 *Oxygen-Deficient Atmospheres*
 V-1 *Compressed Gas Cylinder Valve Inlet and Outlet Connections*
 V-7 *Standard Method of Determining Cylinder Valve Outlet Connections for Industrial Gas Mixtures.*
 — *Handbook of Compressed Gases, Third Edition*

Praxair asks users of this product to study this MSDS and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair MSDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current Praxair MSDSs for these products, contact your Praxair sales representative or local distributor or supplier. If you have questions regarding Praxair MSDSs, would like the form number and date of the latest MSDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (**Phone:** 1-800-PRAXAIR; **Address:** Praxair Call Center, Praxair, Inc., PO Box 44, Tonawanda, NY 14150-7891).

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