



**MATERIAL SAFETY DATA SHEET**

PRODUCT NAME: NITRIC OXIDE

**1. Chemical Product and Company Identification**

**BOC Gases,  
Division of  
The BOC Group, Inc.  
575 Mountain Avenue  
Murray Hill, NJ 07974**

**BOC Gases  
Division of  
BOC Canada Limited  
5975 Falbourne Street, Unit 2  
Mississauga, Ontario L5R 3W6**

**TELEPHONE NUMBER:** (908) 464-8100  
**24-HOUR EMERGENCY TELEPHONE NUMBER:**  
CHEMTREC (800) 424-9300

**TELEPHONE NUMBER:** (905) 501-1700  
**24-HOUR EMERGENCY TELEPHONE NUMBER:**  
(905) 501-0802  
**EMERGENCY RESPONSE PLAN NO:** 20101

**PRODUCT NAME:** NITRIC OXIDE  
**CHEMICAL NAME:** Nitric Oxide  
**COMMON NAMES/SYNONYMS:** Nitrogen Monoxide  
**TDG (Canada) CLASSIFICATION:** 2.3 (5.1, 8)  
**WHMIS CLASSIFICATION:** A, C, D1A, E, D2B

**PREPARED BY:** Loss Control (908)464-8100/(905)501-1700  
**PREPARATION DATE:** 6/1/95  
**REVIEW DATES:** 6/7/96

**2. Composition, Information on Ingredients**

| INGREDIENT   | % VOLUME | PEL-OSHA <sup>1</sup> | TLV-ACGIH <sup>2</sup> | LD <sub>50</sub> or LC <sub>50</sub><br>Route/Species |
|--|----------|-----------------------|------------------------|---|
| Nitric Oxide<br>FORMULA: NO<br>CAS: 10102-43-9<br>RTECS #: QX0525000 | 100      | 25 ppm TWA            | 25 ppm TWA             | LC <sub>50</sub><br>1068 mg/m <sup>3</sup><br>(rat)   |

<sup>1</sup> As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)

<sup>2</sup> As stated in the ACGIH 1994-95 Threshold Limit Values for Chemical Substances and Physical Agents

**3. Hazards Identification**

**EMERGENCY OVERVIEW**

Nitric Oxide is severely irritating to eyes and respiratory system. Effects may be delayed for several hours following exposure. Corrosive. Inhalation may result in chemical pneumonitis and pulmonary edema. Nonflammable. Oxidizer. This product accelerates the combustion of combustible material.

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**ROUTE OF ENTRY:**

|                     |                       |                    |                   |                 |
|---------------------|-----------------------|--------------------|-------------------|-----------------|
| Skin Contact<br>Yes | Skin Absorption<br>No | Eye Contact<br>Yes | Inhalation<br>Yes | Ingestion<br>No |
|---------------------|-----------------------|--------------------|-------------------|-----------------|

**HEALTH EFFECTS:**

|                                      |                           |                     |
|--------------------------------------|---------------------------|---------------------|
| Exposure Limits<br>Yes               | Irritant<br>Yes           | Sensitization<br>No |
| Teratogen<br>No                      | Reproductive Hazard<br>No | Mutagen<br>No       |
| Synergistic Effects<br>None Reported |                           |                     |

Carcinogenicity: -- NTP: No IARC: No OSHA: No

**EYE EFFECTS:**

Severely irritating to the eyes.

**SKIN EFFECTS:**

Severely irritating to dermal tissues.

**INGESTION EFFECTS:**

None. This product is a gas and cannot be ingested.

**INHALATION EFFECTS:**

Nitric oxide vapors are a strong irritant to the pulmonary tract. At high concentrations initial symptoms of inhalation may be moderate and include irritation to the throat, tightness of the chest, headache, nausea and gradual loss of strength. Severe symptoms may be delayed (possible for several hours) and include cyanosis, increased difficulty in breathing, irregular respiration, lassitude and possible eventual death due to pulmonary edema in untreated cases.

**NFPA HAZARD CODES**

Health: 3  
Flammability: 0  
Reactivity: 0  
OXIDIZER

**HMIS HAZARD CODES**

Health: 3  
Flammability: 0  
Reactivity: 0

**RATINGS SYSTEM**

0 = No Hazard  
1 = Slight Hazard  
2 = Moderate Hazard  
3 = Serious Hazard  
4 = Severe Hazard

**4. First Aid Measures**

**EYES:**

Immediately flush with tepid water in large quantities, or with a sterile saline solution. Seek medical attention as soon as possible.

**SKIN:**

Immediately flush with tepid water in large quantities, or with a sterile saline solution. Seek medical attention if blisters or other reactions develop.

**INGESTION:**

Not required.

**INHALATION:**

**MSDS:** G-60

**Revised:** 6/7/96

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PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Conscious victims should be CARRIED (not assisted) to an uncontaminated area and inhale fresh air with supplemental oxygen. Quick removal from the contaminated area is most important. Keep the patient warm, quiet and under competent medical observation until the danger of delayed pulmonary edema has passed (at least 72 hours). Any physical exertion during this period should be discouraged as it may increase the severity of the pulmonary edema or chemical pneumonitis. Bed rest is indicated. Unconscious persons should be moved to an uncontaminated area, and if breathing has stopped, administer artificial resuscitation and supplemental oxygen. Once respiration has been restored they should be treated as above.

## 5. Fire Fighting Measures

|   |                           |                                   |
|---|---------------------------|-----------------------------------|
| Conditions of Flammability: Not flammable, Oxidizer |                           |                                   |
| Flash point:<br>None                                | Method:<br>Not Applicable | Autoignition<br>Temperature: None |
| LEL(%): None  | UEL(%): None              |                                   |
| Hazardous combustion products: Oxides of nitrogen   |                           |                                   |
| Sensitivity to mechanical shock: None               |                           |                                   |
| Sensitivity to static discharge: None               |                           |                                   |

### FIRE AND EXPLOSION HAZARDS:

Nitric oxide is nonflammable but will support combustion. As examples: In NO, hydrogen has a LEL of 13.5% and an UEL of 49% Methane 9-22% and Butane 7.5-12.5%.

### EXTINGUISHING MEDIA:

Not Applicable. Use media appropriate for surrounding materials. Nitric oxide hydrolyzes to nitric acid in the presence of moisture.

### FIRE FIGHTING INSTRUCTIONS:

Cut off the flow of gas if possible.

## 6. Accidental Release Measures

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with inert gas prior to attempting repairs. If leak is in container or container valve, contact the appropriate emergency telephone number listed in Section 1 or call your closest BOC location.

## 7. Handling and Storage

### Electrical Classification:

Nonhazardous.

Nitric oxide is noncorrosive and may be used with most common structural materials. However, in the presence of moisture and oxygen, corrosive conditions will develop as a result of the formation of nitric and nitrous acids. Prior to use, systems to contain nitric oxide must first be purged with an inert gas. Where air contamination cannot be eliminated, stainless steel materials should be used.

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3000 psig) piping

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or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the system.

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130 °F (54 °C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time.

Never carry a compressed gas cylinder or a container of a gas in cryogenic liquid form in an enclosed space such as a car trunk, van or station wagon. A leak can result in a fire, explosion, asphyxiation or a toxic exposure.

## 8. Exposure Controls, Personal Protection

### EXPOSURE LIMITS<sup>1</sup>:

| INGREDIENT   | % VOLUME       | PEL-OSHA <sup>2</sup> | TLV-ACGIH <sup>3</sup> | LD <sub>50</sub> or LC <sub>50</sub><br>Route/Species |
|--|----------------|-----------------------|------------------------|---|
| Nitric Oxide<br>FORMULA: NO<br>CAS: 10102-43-9<br>RTECS #: QX0525000 | 98.0 to 99.995 | 25 ppm TWA            | 25 ppm TWA             | LC <sub>50</sub><br>1068 mg/m <sup>3</sup><br>(rat)   |

<sup>1</sup> Refer to individual state or provincial regulations, as applicable, for limits which may be more stringent than those listed here.

<sup>2</sup> As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)

<sup>3</sup> As stated in the ACGIH 1994-1995 Threshold Limit Values for Chemical Substances and Physical Agents.

IDLH (Nitric Oxide): 100 ppm

### ENGINEERING CONTROLS:

Local exhaust to prevent accumulation of NO above the exposure limit.

### EYE/FACE PROTECTION:

Gas-tight safety goggles or full-face respirator.

### SKIN PROTECTION:

Protective gloves of Rubber or Teflon ®.

### RESPIRATORY PROTECTION:

Positive pressure air line with full-face mask and escape bottle or self-contained breathing apparatus should be available for emergency use.

### OTHER/GENERAL PROTECTION:

Safety shoes and eyewash.

## 9. Physical and Chemical Properties

| PARAMETER                           | VALUE   | UNITS |
|-------------------------------------|---|-------|
| Physical state (gas, liquid, solid) | : Gas   |       |
| Vapor pressure                      | : above critical temp.                                      |       |
| Vapor density at STP (Air = 1)      | : 1.04  |       |
| Evaporation point                   | : Not Available   |       |
| Boiling point                       | : -241.2  | °F    |
|                                     | : -151.9  | °C    |
| Freezing point                      | : -262.5  | °F    |
|                                     | : -163.6  | °C    |
| pH                                  | : Not Applicable  |       |
| Specific gravity                    | : Not Available   |       |
| Oil/water partition coefficient     | : Not Available   |       |
| Solubility (H2O)                    | : Negligible  |       |
| Odor threshold                      | : Not Applicable  |       |
| Odor and appearance                 | : Colorless gas with suffocating odor, reddish brown in air |       |

## 10. Stability and Reactivity

### STABILITY:

Stable

### INCOMPATIBLE MATERIALS:

Oxidizing agents, halides, hydrocarbons and oxygen. Reacts vigorously with fluorine, fluorine oxides and chlorine in the presence of moisture.

### HAZARDOUS DECOMPOSITION PRODUCTS:

Oxidizes in air to form nitrogen dioxide, which is extremely reactive and a strong oxidizer. Upon contact with moisture and oxygen, it produces nitrous and nitric acids.

### HAZARDOUS POLYMERIZATION:

Will not occur.

## 11. Toxicological Information

### MUTAGENIC:

There is unspecified mutagenic data for nitric oxide (SAX/RTECS).

### OTHER:

Chronic or repeated exposure may cause permanent decrements in pulmonary function (Silo Filler's Disease). The absence of marked acute irritation of nitric oxide limits its warning properties.

## 12. Ecological Information

No data given.

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### 13. Disposal Considerations

Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED, WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to BOC Gases or authorized distributor for proper disposal.

### 14. Transport Information

| PARAMETER              | United States DOT               | Canada TDG                      |
|------------------------|---------------------------------|---------------------------------|
| PROPER SHIPPING NAME:  | Nitric Oxide                    | Nitric Oxide                    |
| HAZARD CLASS:          | 2.3                             | 2.3 (5.1, 8)                    |
| IDENTIFICATION NUMBER: | UN 1660                         | UN 1660                         |
| SHIPPING LABEL:        | POISON GAS, OXIDIZER, CORROSIVE | POISON GAS, OXIDIZER, CORROSIVE |

**Additional Marking Requirement:** "Inhalation Hazard"

**Additional Shipping Paper Description Requirement:** "Poison-Inhalation Hazard, Zone B"

### 15. Regulatory Information

Nitric oxide is listed under the accident prevention provisions of section 112(r) of the Clean Air Act (CAA) with a threshold quantity (TQ) of 10,000 pounds.

#### SARA TITLE III NOTIFICATIONS AND INFORMATION

Nitric oxide is listed as an extremely hazardous substance (EHS) subject to state and local reporting under Section 304 of SARA Title III (EPCRA).

The presence of nitric oxide in quantities in excess of the threshold planning quantity (TPQ) of 100 pounds requires certain emergency planning activities to be conducted.

Releases of nitric oxide in quantities equal to or greater than the reportable quantity (RQ) of 10 pounds are subject to reporting to the National Response Center under CERCLA, Section 304 SARA Title III.

#### SARA TITLE III - HAZARD CLASSES:

Acute Health Hazard  
Chronic Health Hazard  
Sudden Release of Pressure Hazard  
Reactivity Hazard

## 16. Other Information

Compressed gas cylinders shall not be refilled without the express written permission of the owner. Shipment of a compressed gas cylinder which has not been filled by the owner or with his/her (written) consent is a violation of transportation regulations.

### **DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:**

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