



MATERIAL SAFETY DATA SHEET

PRODUCT NAME: NITROGEN DIOXIDE

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

TELEPHONE NUMBER: (905) 501-1700

24-HOUR EMERGENCY TELEPHONE NUMBER:

24-HOUR EMERGENCY TELEPHONE NUMBER:

CHEMTREC (800) 424-9300

(905) 501-0802

EMERGENCY RESPONSE PLAN NO: 20101

PRODUCT NAME: NITROGEN DIOXIDE

CHEMICAL NAME: Nitrogen Dioxide

COMMON NAMES/SYNONYMS: Nitrogen Oxide; Nitrogen Peroxide

TDG (Canada) CLASSIFICATION: 2.3 (5.1)

WHMIS CLASSIFICATION: A, C, E, D1A, D2A, 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 ¹	TLV-ACGIH ²	LD ₅₀ or LC ₅₀ Route/Species
Nitrogen Dioxide FORMULA: NO2 CAS: 10102-44-0 RTECS #: QW9800000	100.0	5 ppm Ceiling	3 ppm TWA 5 ppm STEL	LC ₅₀ 88 ppm/4H (rat)

¹ As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)

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

3. Hazards Identification

EMERGENCY OVERVIEW
Corrosive and irritating to the eyes, skin, and mucous membranes. Inhalation may result in chemical pneumonitis and pulmonary edema.

ROUTE OF ENTRY:

Skin Contact Yes	Skin Absorption No	Eye Contact Yes	Inhalation Yes	Ingestion No
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PRODUCT NAME: NITROGEN DIOXIDE

HEALTH EFFECTS:

Exposure Limits Yes	Irritant Yes	Sensitization No
Teratogen Yes	Reproductive Hazard Yes	Mutagen Yes
Synergistic Effects None Reported		

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

EYE EFFECTS:

Contact with liquid causes a severe corrosive action on the eyes. PERSONS WITH POTENTIAL EXPOSURE TO NITROGEN DIOXIDE SHOULD NOT WEAR CONTACT LENSES.

SKIN EFFECTS:

Contact with liquid causes a severe corrosive action on the skin.

INGESTION EFFECTS:

None known. Ingestion is unlikely.

INHALATION EFFECTS:

Vapors are a strong irritant to the pulmonary tract. Initial symptoms of inhalation may be moderate and include irritation of the eyes and throat, tightness of the chest, headache, nausea and gradual loss of strength. Severe symptoms may be delayed (possibly for 5 to 7 hours) and include cyanosis, increased difficulty in breathing, irregular respiration, lassitude and possible eventual death due to pulmonary edema in untreated cases.

There's experimental animal data to suggest a possible teratogenic, reproductive or mutagenic effect.

NFPA HAZARD CODES

Health: 3
Flammability: 0
Reactivity: 0

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:

Flush contaminated eye(s) with copious quantities of water. Part eyelids to assure complete flushing. Continue for a minimum of 30 minutes. Seek medical attention.

SKIN:

Flush affected area with copious quantities of water. Remove affected clothing as rapidly as possible. Subsequently treat as for a thermal burn.

INGESTION:

None normally required.

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INHALATION:

Conscious persons should be carried (not assisted) to an uncontaminated area and breath fresh air supplemented with oxygen. 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, given artificial resuscitation and supplemental oxygen. Once respiration has been restored, they should be treated as above.

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO NITROGEN DIOXIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND WEAR PROTECTIVE CLOTHING AND BOOTS IF THE LIQUID HAS SPILLED OR IS BEING DISCHARGED.

5. Fire Fighting Measures

Conditions of Flammability: None, Oxidizer		
Flash point: None	Method: Not Applicable	Autoignition Temperature: None
LEL(%): None	UEL(%): None	
Hazardous combustion products: Nitrogen Compounds		
Sensitivity to mechanical shock: None		
Sensitivity to static discharge: None		

FIRE AND EXPLOSION HAZARDS:

Nitrogen Dioxide is a strong oxidizing agent and will support combustion. It explodes on contact with alcohols, hydrocarbons, organic materials and fuels. Decomposes on contact with water to produce nitric and nitrous acids. Acts as a catalyst for the explosive reaction of oxygen and hydrogen.

EXTINGUISHING MEDIA:

Water spray or fog. Do not use halogenated materials.

FIRE FIGHTING INSTRUCTIONS:

Although nonflammable, nitrogen dioxide can support combustion. In case of fire, an attempt should be made to shut off the source of nitrogen dioxide. Continued application of large quantities of water will eventually dilute the oxidizers so that combustion is no longer supported. The remaining air-supported fire may be extinguished by the appropriate method.

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

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 125°F (52°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.

Use only in well-ventilated areas. Valve protection caps and valve outlet threaded plugs 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. 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 cylinder.

ANHYDROUS nitrogen dioxide is noncorrosive to most metals at normal temperatures. It does corrode copper and its alloys. Teflon is the preferred gasket material.

Keep equipment scrupulously dry. For additional storage and handling recommendations, consult Compressed Gas Association Pamphlet P-1.

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 LIMITS¹:

INGREDIENT	% VOLUME	PEL-OSHA ²	TLV-ACGIH ³	LD ₅₀ or LC ₅₀ Route/Species
Nitrogen Dioxide FORMULA: NO ₂ CAS: 10102-44-0 RTECS #: QW9800000	100.0	5 ppm Ceiling	3 ppm TWA 5 ppm STEL	LC ₅₀ 88 ppm/4H (rat)

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

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

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

ENGINEERING CONTROLS:

Use a laboratory hood with forced ventilation for small quantities or local exhaust to prevent accumulation above exposure limits for larger quantities.

EYE/FACE PROTECTION:

Safety goggles or glasses plus a face shield.

SKIN PROTECTION:

Rubber or teflon protective gloves.

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, safety shower, eyewash "fountain," polyethylene clothing.

9. Physical and Chemical Properties

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Liquid	
Vapor pressure @ STP	: 14.8	psia
Vapor density (Air = 1)	: 2.83	
Evaporation point	: Not Available	
Boiling point	: 70	°F
	: 21.1	°C
Freezing point	: 11.84	°F
	: -11.20	°C
pH	: Not Available	
Specific gravity	: Not Available	
Oil/water partition coefficient	: Not Available	
Solubility (H2O)	: Decomposes	
Odor threshold	: Not Available	
Odor and appearance	: Acrid suffocating odor; Yellow-brown liquid to reddish-brown gas.	

10. Stability and Reactivity

STABILITY:

Stable

CONDITIONS TO AVOID (STABILITY):

Temperatures above 320 °F (160 °C).

INCOMPATIBLE MATERIALS:

Hydrocarbons, fuels.

HAZARDOUS DECOMPOSITION PRODUCTS:

None

HAZARDOUS POLYMERIZATION:

Will not occur.

11. Toxicological Information

The vapor is highly toxic and hazardous because of its ability to cause delayed chemical pneumonitis and pulmonary edema. Chronic or repeated exposure may cause permanent decrements in pulmonary function (silico filler's disease). The absence of marked acute irritation of nitrogen dioxide limits its warning properties.

LC₅₀ (Rat), Inhalation of 88 ppm for 4 hours.

Experimental data indicate this compound may produce teratogenic, reproductive or mutagenic effects.

12. Ecological Information

OTHER ENVIRONMENTAL INFORMATION:

MSDS: G-61

Revised: 6/7/96

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The reportable quantity is the minimum quantity of a material that when released, requires reporting to appropriate Federal, State and Local officials. Notification requirements are found under CERCLA Section 103(a). Initial notification may be by telephone, radio, or in person. A written follow-up notice is also required.

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:	Nitrogen Dioxide, liquefied	Nitrogen Dioxide, liquefied
HAZARD CLASS:	2.3	2.3 (5.1)
IDENTIFICATION NUMBER:	UN 1067	UN 1067
SHIPPING LABEL:	POISON GAS, OXIDIZER, CORROSIVE	POISON GAS, OXIDIZER, CORROSIVE

Additional Marking Requirement: "Inhalation Hazard"

If net weight of product \geq 10 pounds, the container must be also marked with the letters "RQ".

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

If net weight of product \geq 10 pounds, the shipping papers must be also marked with the letters "RQ".

15. Regulatory Information

SARA TITLE III NOTIFICATIONS AND INFORMATION

Releases of nitrogen dioxide 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.

Nitrogen dioxide is listed under Section 302 as an Extremely Hazardous Substance (EHS). The presence of nitrogen dioxide in quantities in excess of the Threshold Planning Quantity (TPQ) of 100 pounds requires certain emergency planning activities to be conducted.

SARA TITLE III - HAZARD CLASSES:

Sudden Release of Pressure Hazard

Acute Health 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:

Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the

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consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).