Emergency Contact: Chemtrec (800) 424-9300
Or Norco (208) 336-1643

1125 West Amity Road
Boise, ID 83705
(208) 336-1643

Nitrogen Dioxide in Air 0.0002% to 0.005%

MATERIAL SAFETY DATA SHEET

Identification

Product Name: Nitrogen Dioxide 0.0002% to 0.005% (2 to 500 PPM) in Air
CAS Number: N/A
Chemical Family: Gas Mixture
Chemical Formula: NO_2 in Air
Synonyms: Calibration Gas Mixture, Cal Gas, NOx Gas Mix
MSDS Identification Code/Number: 2220
Prepared By: Corporate Production Dept.

Revision Date 03/05/02
Last Review Date: 06/02/08

Composition, Information on Ingredients

Exposure Limits[1]:

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	0.0002% to 0.005%	5 ppm Ceiling	3 ppm TWA 5ppm STEL	LC_{50}: 115 ppm Inhalation rat (1 hr-time adjusted CGA-P-20, 2003)
Air Formula: Not applicable CAS: Not Applicable RTECS#: Not Applicable	99.005% to 99.9999%	None Established	None Established	Not Available

[1]Refer to individual state or provincial regulations, as applicable, for limits that 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 2007 Threshold Limit Values for Chemical Substances and Physical Agents.

OSHA Regulatory Status: This material is classified as hazardous under OSHA regulations.

Hazards Identification

Emergency Overview:

This product is a colorless gas with a slight acrid odor. At higher concentrations nitrogen dioxide has a reddish brown color. Nitrogen dioxide is extremely toxic by inhalation, and symptoms of over-exposure may not become apparent for up to 72 hours. Over-exposures to this gas may result in severe irritation and burns of eyes, skin, mucous membranes, and any other exposed tissue. If high concentrations of nitrogen dioxide (>100 ppm) are inhaled, delayed pulmonary damage and breathing difficulty may occur. Contents under pressure. Use and store below 125^{O} F (52^{O} C).

Hazards Identification Cont.

Route of Entry:

Skin Contact	Skin Absorption	Eye Contact	Inhalation	Ingestion
Yes	No	Yes	Yes	No

Health Effects:

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

Carcinogenicity: NTP: No IARC: No OSHA: No

Eye Effects:
May cause eye irritation. Contact with rapidly expanding gas near the point of release may cause frostbite.

Skin Effects:
Repeated exposure may irritate the skin. Contact with rapidly expanding gas near the point of release may cause frostbite with redness, skin color change to gray or white, and blistering.

Ingestion Effects:
Ingestion is unlikely. Product is a gas at room temperature.

Inhalation Effects:
Gas mixture contains less than 500 ppm nitrogen dioxide, which can irritate the pulmonary tract. Initial symptoms may include eye and throat irritation, chest tightness, headache, and nausea. Inhalation of high concentrations may cause swelling and fluid retention in the lungs, which can be fatal. Symptoms may be delayed for up to 72 hours following exposure. Nitrogen is a non-toxic simple asphyxiant. Toxic effects of nitrogen dioxide exposure would be expected before asphyxiation occurred.

Medical Conditions Aggravated by Exposure:
Irritant properties may aggravate pre-existing eye, skin, and respiratory disorders.

Potential Environmental Effects:
Ecotoxicity information was unavailable. Nitrogen dioxide will react with moisture to form nitric acid in soil and water.

NFPA Hazard Codes		**HMIS Hazard Codes**		**Ratings System**
Health:	1	Health:	1	0 = No Hazard
Flammability:	0	Flammability:	0	1 = Slight hazard
Instability:	0	Physical Hazard:	3	2 = Moderate Hazard
				3 = Serious Hazard
				4 = Severe Hazard

Note: Ratings were assigned in accordance with Compressed Gas Association (CGA) guidelines as published in CGA Pamphlet P-19-2004, *CGA Recommended Hazard Ratings for Compressed Gases, 2nd Edition.*

First Aid Measures

Eye:
PERSONS WITH POTENTIAL EXPOSURE TO NITROGEN DIOXIDE SHOULD NOT WEAR CONTACT LENSES. Flush eyes with large amounts of water for at least 15 minutes, holding eyelids open to ensure adequate rinsing. If irritation persists, seek immediate medical attention.

First Aid Measures Continued

Skin:
Flush contaminated skin with large amounts of water. For frostbite, immerse skin in lukewarm water. If irritation persists or frostbite occurs, get medical attention.

Ingestion:
Not anticipated; product is a gas.

Inhalation:
PROMPT REMOVAL FROM THE CONTAMINATED AREA AND IMMEDIATE MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

Delayed onset of life-threatening symptoms is likely to occur. **Victim(s) must be taken for medical attention.**

Victims should be carried (not assisted) to an uncontaminated area and inhale fresh air supplemented with oxygen. Quick removal from the contaminated area is most important. Keep 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.

Fire Fighting Measures

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

Fire and Explosion Hazards:
Nonflammable. Cylinders may vent rapidly or rupture violently from pressure when involved in a fire situation.

Extinguishing Media:
Use media suitable for surrounding combustible or flammable materials. Nitrogen dioxide can slowly react with water to form a corrosive solution of nitric acid. Nitric acid is corrosive to skin and metal. Small amounts of nitrogen dioxide present are incompatible with halogenated extinguishing media.

Fire Fighting Instructions:
Stop the flow of gas if it can be done without risk. Use water spray to cool surrounding containers. Continue to cool surrounding containers until well after flames are extinguished. Firefighters should wear a full-face piece, NIOSH/MSHA-approved self-contained breathing apparatus (SCBA) operated in positive pressure mode and full turnout gear.

Accidental Release Measures

Isolate hazard area, evacuate personnel and deny entry to unauthorized/unprotected individuals. Extinguish all ignition sources and ventilate closed spaces and low areas. Personnel entering area should wear appropriate protective equipment, including respiratory protection suitable for unknown concentrations. Personnel should not re-enter an area until nitrogen dioxide has sufficiently dispersed and adequate oxygen re-established. If a leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container valve, contact the appropriate emergency telephone number listed in Section 1 or call your closest Norco/NorLab location.

Handling and Storage

Electrical classification:
Non-hazardous

This gas mixture is non-corrosive. Nitrogen dioxide content may cause some corrosion of copper and copper alloys. Teflon is the preferred gasket material for pure nitrogen dioxide.

Use only in well-ventilated areas. Valve protection caps must remain in place on refillable cylinders unless cylinder 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 piping 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 cylinder.

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavy traffic areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 125^{O} F (52^{O} C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time.

For additional 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.

Exposure Controls, Personal Protection

Engineering Controls:
Use a laboratory hood with forced ventilation for handling small quantities. Use local exhaust to prevent accumulation above the exposure limit.

Eye/Face Protection:
Chemical safety goggles with full faceshield.

Skin Protection:
Protective gloves as appropriate for the job (rubber or Teflon for pure nitrogen dioxide).

Respiratory Protection:
For an emergency release use a NIOSH/MSHA-approved full-facepiece SCBA or a supplied air respirator with a full-facepiece operated in positive pressure mode with an escape bottle. Respirators should be stored in an area not likely to be contaminated.

Other/General Protection:
Safety shoes, safety showers and an emergency eyewash station should be available.

Physical and Chemical Properties

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Gas	
Vapor pressure	: Not applicable	
Vapor density (Air = 1)	: 0.906	
Evaporation point	: Not applicable	
Boiling point	: -320.4	^{O}F
	: -195.8	^{O}C
Freezing point	: -345.9	^{O}F
	: -209.9	^{O}C
pH	: Not applicable	
Specific gravity	: Not available	
Oil/water partition coefficient	: Not available	
Solubility (H_2O) vol/vol @0^{O} C (32^{O}F) and 1 atm.	: 0.023	
Odor threshold	: 0.1 to 0.4 ppm for nitrogen dioxide	
Odor and appearance	: Colorless to red-brown non-flammable gas with an acidic odor.	

Stability and Reactivity

Stability:
Stable under normal conditions.

Incompatible Materials:
Nitrogen dioxide is not compatible with strong bases, strong oxidizers, alkali metals, alkali earth metals and powdered metals.

Hazardous Decomposition Products:
None

Hazardous Polymerization:
Will not occur.

Toxicological Information

Skin and Eye:
Nitrogen dioxide concentrations of 10-20 ppm have caused mild eye, nose, and upper respiratory irritation.

Inhalation:
Pure nitrogen dioxide is a highly toxic and corrosive gas, which can cause delayed lung injury. The 1-hour LC_{50} for nitrogen dioxide in the rat is 115 ppm.

Other:
Monkeys exposed to 10 ppm NO_2 for 1 month or 5 ppm NO_2 for 2 months showed marked decrease in resistance to infection.

The incidences of chronic lung effects from long-term exposures to low concentrations of nitrogen dioxide are not well defined. No chronic effects were reported in animals (dogs, rabbits, guinea pigs, rats, hamsters, and mice) exposed for 16-18 months to concentrations of 1 ppm (no mice), 5 ppm, or 25 ppm(no dogs or mice) nitrogen dioxide.

Experimental evidence indicates that nitrogen dioxide may have mutagenic effects; however, results have been equivocal.

Ecological Information

Product does not contain Class I or Class II ozone depleting substances. Bioconcentration data for nitrogen dioxide was unavailable.

Disposal Considerations

Do not attempt to dispose of waste or unused quantities in returnable cylinders. Return in the shipping container, *properly labeled, with any valve outlet plugs or caps secure and valve protection cap in place* to NorLab for proper disposal. Non-refillable containers should be vented in a well-ventilated area then disposed of in compliance with local regulations, or returned to NorLab.

Transportation Information

Parameter	United States DOT	Canada TDG
Proper Shipping Name:	Compressed gases, n.o.s., (nitrogen dioxide, air)	Compressed gases, n.o.s.
Hazard Class:	2.2	2.2
Identification Number:	UN 1956	UN 1956
Shipping Label:	Non Flammable Gas	Non Flammable Gas

Regulatory Information

SARA Title III Notifications and Information:
SARA Title III – Section 313 Supplier Notification:
This product does not contain toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community right-To-Know Act (EPCRA) of 1986 and 40 CFR 372.

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:
Acute Health Hazard
Sudden Release of Pressure Hazard

California Proposition 65:
This product does not contain ingredient(s) known to the State of California to cause cancer or reproductive toxicity.

Other Information

Compressed gas cylinders must 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.

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