



MATERIAL SAFETY DATA SHEET

PRODUCT NAME: OXYGEN, REFRIGERATED LIQUID

1. 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: 2-0101**

**PRODUCT NAME: OXYGEN, REFRIGERATED LIQUID
CHEMICAL NAME: Oxygen
COMMON NAMES/SYNONYMS: Liquid Oxygen, LOX
TDG (Canada) CLASSIFICATION: 2.2 (5.1)
WHMIS CLASSIFICATION: A, C**

**PREPARED BY: Loss Control (908)464-8100/(905)501-1700
PREPARATION DATE: 6/1/95
REVIEW DATES: 06/18/04**

2. Composition, Information on Ingredients

EXPOSURE LIMITS¹:

INGREDIENT	% VOLUME	PEL-OSHA ²	TLV-ACGIH ³	LD ₅₀ or LC ₅₀ Route/Species
Oxygen FORMULA: O ₂ CAS: 7782-44-7 RTECS #: RS2060000	99.6 to 99.997	None Established	Not Available	Not Available

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 2004 Threshold Limit Values for Chemical Substances and Physical Agents.

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

3. Hazards Identification

EMERGENCY OVERVIEW

Clear odorless pale blue liquid and colorless gas. Nonflammable, oxidizer. Will accelerate combustion and increase the risk of fire and explosion in combustible or flammable materials. Elevated oxygen levels may result in cough and other pulmonary changes. Non-toxic. Prolonged inhalation of high concentrations may cause coughing and lung effects. Contact with liquid form may cause frostbite or freeze burns in exposed tissues. Contents under pressure. Use and store below 125 °F.

PRODUCT NAME: OXYGEN, REFRIGERATED LIQUID

ROUTE OF ENTRY:

Skin Contact Yes	Skin Absorption No	Eye Contact Yes	Inhalation Yes	Ingestion No
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HEALTH EFFECTS:

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

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

EYE EFFECTS:

Contact with evaporating liquid may cause tissue freezing.

SKIN EFFECTS:

Contact with evaporating liquid product can cause cryogenic "burns" or frostbite. Frostbite effects are a change in color of the skin to gray or white, possibly followed by blistering.

INGESTION EFFECTS:

Contact with liquid product may cause tissue freezing.

INHALATION EFFECTS:

Oxygen is not acutely toxic under normal pressure. Prolonged inhalation of high oxygen concentrations (> 75%) may affect coordination, attention, and cause tiredness or respiratory irritation.

Oxygen is more toxic when inhaled at elevated pressures. Depending upon pressure and duration of exposure, pure oxygen at elevated pressures (i.e.: divers) may cause cramps, dizziness, difficulty breathing, convulsions, edema, and death.

Elevated oxygen concentrations in incubators has caused visual impairment and blindness in premature infants. High oxygen concentrations primarily affect eyes which are not fully developed (see Section 11).

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None known.

POTENTIAL ENVIRONMENTAL EFFECTS: Not expected to be toxic to fish and wildlife.

4. First Aid Measures

EYE:

Never introduce ointment or oil into the eyes without medical advice! In case of freezing or cryogenic "burns" caused by rapidly evaporating liquid, DO NOT WASH THE EYES WITH HOT OR EVEN TEPID WATER! Remove victim from the source of contamination. For contact with small amounts of liquid, open the eyelids wide to allow the liquid to evaporate. For contact with large amounts, rinse with a low pressure stream of cool water for 15 minutes. Refer the victim to an ophthalmologist for treatment and follow up. If the victim cannot tolerate light, protect the eyes with dark glasses. The use of bandages is not recommended as keeping the eyelids closed or exerting pressure on the eyelid may cause further damage.

SKIN:

For dermal contact or frostbite: Remove contaminated clothing and flush affected areas with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if contact with the product has resulted in blistering of the dermal surface or in deep tissue freezing.

MSDS: G-102

Revised: 06/18/04

PRODUCT NAME: OXYGEN, REFRIGERATED LIQUID

INGESTION:

A physician should see the patient promptly if the cryogenic "burn" has resulted in blistering of the dermal surface or deep tissue freezing.

INHALATION:

Overexposure to oxygen is not anticipated under normal working conditions. High oxygen concentrations in the air may present a fire and explosion hazard. **PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE WHEN OXYGEN IS INHALED UNDER PRESSURE** (i.e.: as in scuba diving). Conscious persons should be removed from exposure and inhale fresh air. Quick removal from the source of exposure or contaminated area is most important. Further treatment should be symptomatic and supportive. Inform the treating physician that the patient could be experiencing hyperoxia.

5. Fire Fighting Measures

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

FIRE AND EXPLOSION HAZARDS:

High oxygen concentrations vigorously accelerate combustion. Will support or initiate combustion/ explosion of organic matter and other oxidizable material. Many materials that are not combustible in air will burn in oxygen enriched atmosphere. Cylinder may vent rapidly or rupture violently from pressure when involved in a fire situation.

EXTINGUISHING MEDIA:

Water spray to keep cylinders cool. Extinguishing agent appropriate for the combustible material.

FIRE FIGHTING INSTRUCTIONS:

If possible, stop the flow of oxygen which is supporting the fire. Immediately cool containers with water spray from maximum distance. Do not direct water spray at container vent. Move cooled containers from fire area if it can be done without risk. Firefighters should wear respiratory protection (SCBA) and full turnout or Bunker gear. Continue to cool fire-exposed cylinders until well after flames are extinguished.

6. Accidental Release Measures

Evacuate all personnel from affected area. A leak near combustible or flammable materials may represent a severe fire or explosion hazard. Eliminate all ignition sources. Use appropriate protective equipment (See Section 8). Stop the flow of gas or remove cylinder to outdoor location if this can be done without risk. Ventilate enclosed areas. To increase vaporization rate, spray large amounts of water onto the spill from an upwind position. 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.

PRODUCT NAME: OXYGEN, REFRIGERATED LIQUID

Liquid oxygen cannot be handled in carbon or low alloy steel. 18-8 and 18-10 stainless steel are acceptable as are copper and its alloys, nickel and its alloys, brass bronze, silicon alloys, Monel®, Inconel® and beryllium. Teflon®, Teflon® composites, or Kel-F® are preferred non-metallic gasket materials.

Equipment to contain oxygen must be “cleaned for oxygen service”. Check with supplier to verify oxygen compatibility for the service conditions. Stationary customer site vessels should operate in accordance with the manufacturer's and BOC's instruction. Do not attempt to repair, adjust or in any other way modify the operation of these vessels. If there is a malfunction or other type of operations problem with the vessel, contact the closest BOC location immediately.

Oxygen, refrigerated liquid is delivered to a customer into stationary, vacuum-jacketed vessels at the customer's location or in portable vacuum-jacketed "liquid" cylinders. Post “NO SMOKING OR OPEN FLAMES” signs in storage and use areas. There should be no sources of ignition in storage and use areas. Containers of liquid oxygen should be separated from flammable gas containers by a minimum distance of 20 ft., or by a barrier of non-combustible material at least 5 ft. high having a fire resistance rating of ½ hour.

Liquid oxygen vessels should be used only in well ventilated areas in accordance with manufacture and BOC's instructions. Cylinders must always be kept upright. Specialized trucks are needed for their movement. Do not tip, drag, slide, or roll cylinders. Full and empty cylinders should be stored away from flammable and combustible products. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. If user experiences any difficulty operating container valve discontinue use and contact supplier. Do not insert any object (i.e.: screwdriver) into valve cap openings as this can damage the valve causing leakage. Use a pressure reducing regulator when connecting cylinder to lower pressure piping or systems. Do not heat containers 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 containers from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Containers 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 containers being stored for excessive periods of time.

Never allow any unprotected part of the body to touch uninsulated pipes or vessels containing cryogenic fluids. The extremely cold metal will cause the flesh to stick and tear when you attempt to remove it.

For additional recommendations, consult Compressed Gas Association Pamphlets G-4, P-12, P-2.6, PS-4, AV-10, G-4.1, G-4.3, G-4.9, O2-DIR, P-8.1, P-8.2, SP-E, TB-12, and SB-9.

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

ENGINEERING CONTROLS: Use local exhaust in combination with general ventilation as necessary to keep oxygen concentrations below 23.5%.

EYE/FACE PROTECTION: Wear chemical goggles with faceshields where contact with liquid is possible.

SKIN PROTECTION: Protective gloves made of any suitable material appropriate for the job. Insulated gloves recommended for cryogenic liquids. Gloves must be clean and free from oil and grease.

OTHER/GENERAL PROTECTION: Safety shoes, emergency eyewash station

9. Physical and Chemical Properties

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Cryogenic liquid	
Vapor pressure	: Above critical temp.	
Vapor density (Air = 1)	: 1.14	(@ 70 °F; 1 atm.)
Evaporation point	: Not Available	
Boiling point	: -297.3	°F
	: -182.9	°C
Freezing point	: -361.8	°F
	: -218.8	°C
PH	: Not Applicable	
Specific gravity	: 1.105	
Oil/water partition coefficient	: Not Applicable	
Solubility (H ₂ O)	: Slight; 0.0489	Vol./Vol. @ 32 °F
Odor threshold	: Not Applicable	
Odor and appearance	: Clear, odorless, pale blue liquid.	

10. Stability and Reactivity

STABILITY:

Stable

INCOMPATIBLE MATERIALS/CONDITIONS:

All flammable, organic, and combustible materials. Avoid heat, sparks, and flame.

HAZARDOUS DECOMPOSITION PRODUCTS: None

HAZARDOUS POLYMERIZATION: Will not occur.

11. Toxicological Information

SKIN AND EYE:

The incompletely developed retinal circulation is more susceptible to toxic levels of oxygen. In premature infants, arterial oxygen tension above 150 mm Hg may cause retrolental fibroplasia. Permanent blindness may occur several months later. One case of severe retinal damage in an adult was reported. An individual suffering from myasthenia gravis developed irreversible retinal atrophy after breathing 80% oxygen for 150 days. Contact with cryogenic liquid can cause tissue freezing.

INHALATION:

Human volunteers which inhaled 90-95% oxygen through a face mask for 6 hours showed signs of tracheal irritation and fatigue. Other symptoms (which might have been caused by placing a tube into the trachea during the experiment) included: sinusitis, conjunctivitis, fever, and symptoms of acute bronchitis.

Poisoning began in dogs 36 hours after inhalation of pure oxygen at atmospheric pressure. Distress was seen within 48 hours and death within 60 hours.

OTHER: At increased pressures, central nervous system toxicity (CNS) can occur.

12. Ecological Information

Product does not contain Class I or Class II ozone depleting substances. Not toxic. Will not bioconcentrate.

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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:	Oxygen, refrigerated liquid	Oxygen, refrigerated liquid
HAZARD CLASS:	2.2 (5.1)	2.2, 5.1
IDENTIFICATION NUMBER:	UN 1073	UN 1073
SHIPPING LABEL:	NONFLAMMABLE GAS, OXIDIZER	NONFLAMMABLE GAS, OXIDIZER

15. Regulatory Information

SARA TITLE III NOTIFICATIONS AND INFORMATION

SARA TITLE III - HAZARD CLASSES:

Fire Hazard

Sudden Release of Pressure Hazard

SARA TITLE III - SECTION 313 SUPPLIER NOTIFICATION:

This product does not contain toxic chemicals subject to reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372.

U.S. TSCA/Canadian DSL: All ingredients are listed on the U.S. Toxic Substances Control Act (TSCA) inventory or exempt from listing and on the Canadian Domestic Substance List (DSL).

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

Canadian Controlled Products Regulations (CPR): This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

16. Other Information

NFPA HAZARD CODES

Health: 3
Flammability: 0
Instability: 0

HMIS HAZARD CODES

Health: 3
Flammability: 0
Physical Hazard: 2

RATINGS SYSTEM

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

OXIDIZER

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*.

PRODUCT NAME: OXYGEN, REFRIGERATED LIQUID

ACGIH	American Conference of Governmental Industrial Hygienists
DOT	Department of Transportation
IARC	International Agency for Research on Cancer
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
SARA	Superfund Amendments and Reauthorization Act
STEL	Short Term Exposure Limit
TDG	Transportation of Dangerous Goods
TLV	Threshold Limit Value
WHMIS	Workplace Hazardous Materials Information System

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.

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