Applications Note OS-102

This Materials Safety Data Sheet (MSDS) by BOC Gasses is the best we have found. It is posted on the Internet

BOC GASES

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: OZONE

1. Chemical Product and Company Identification

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

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

BOC Gases
Division of,
BOC Canada Limited
5975 Falbourne Street, Unit 2
Mississauga, Ontario L5R 3V8

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

PRODUCT NAME: Ozone
CHEMICAL NAME: Ozone
COMMON NAMES/SYNONYMS: Triatomic oxygen
TDG (Canada) CLASSIFICATION: 2.3
WHMIS CLASSIFICATION: D1A, C, D2B

PREPARED BY: Loss Control (908)464-8100/(905)273-7700
PREPARATION DATE: 2/14/97
REVIEW DATES: Not Applicable

2. Composition, Information on Ingredients

INGREDIENT	% VOLUME	PEL-OSHA[1]	TLV-ACGIH[2]	LD_{50} or LC_{50} Route/Species
Ozone FORMULA: O_3 CAS: 10028-15-6 RTECS #: RS8225000	100	0.1 ppm	0.1 ppm (Ceiling)	LC50: 4800 ppb/4 H inhalation/rat

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

[2] As stated in the ACGIH 1996-97 Threshold Limit Values for Chemical Substances and Physical Agents. Ozone is on the "Notice of Intended Changes" with a TLV of: 0.05 ppm for heavy work; 0.08 ppm for moderate work; and 0.10 ppm for light work.

3. Hazards Identification

EMERGENCY OVERVIEW

POISON GAS. OXIDIZER. Colorless to blue gas with characteristic pungent odor which is lethal at relatively low concentrations and at short exposure periods. The primary toxic effect is lung injury characterized by pulmonary congestion, edema, and hemorrhage. Can cause eye, nose, throat, and respiratory irritation. Long-term exposure may result in chronic respiratory disease. Incompatible with all oxidizable materials. Will accelerate combustion when involved in a fire situation.

PRODUCT NAME: OZONE

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	No
Synergistic Effects: Co-exposure with particulates results in enhanced toxic effects.		

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

EYE EFFECTS:
May cause irritation and conjunctivitis.

SKIN EFFECTS:
Adverse effects are not anticipated for gas.

INGESTION EFFECTS:
Product is a gas, ingestion is not anticipated.

INHALATION EFFECTS:
Inhalation of ozone causes lung damage characterized by pulmonary congestion, edema and hemorrhage. Symptoms following acute exposure include headache, fatigue, decreased pulse rate and blood pressure, cough, respiratory stimulation, and irritation of the eyes, nose, throat, and chest.

NFPA HAZARD CODES	HMIS HAZARD CODES	RATINGS SYSTEM
Health: 4	Health: 4	0 = No Hazard
Flammability: 0	Flammability: 0	1 = Slight Hazard
Reactivity: 3	Reactivity: 3	2 = Moderate Hazard
		3 = Serious Hazard
		4 = Severe Hazard

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Exposure to ozone has aggravated or accelerated pre-existing respiratory disease. Irritant properties may aggravate pre-existing eye conditions.

4. First Aid Measures

EYES:
Flush eyes with large amounts of warm water for 15 minutes. If irritation, pain, swelling, lacrimation or photophobia persist, seek medical attention.

SKIN:
Adverse effects are not anticipated following exposure to gas form of ozone.

INGESTION:

Unlikely as product is a gas.

INHALATION:

IMMEDIATELY REMOVE TO UNCONTAMINATED AREA. Quick removal from the contaminated area is most important. Monitor for respiratory distress and administer oxygen or artificial respiration as indicated. SEEK IMMEDIATE MEDICAL ATTENTION.

RESCUE PERSONNEL SHOULD BE EQUIPPED WITH A FULL-FACEPIECE SELF-CONTAINED BREATHING APPARATUS OPERATED IN POSITIVE PRESSURE MODE.

Note to physicians: Ozone is not found in the blood or serum due to rapid reaction with cellular tissues. One of the most sensitive measures of ozone exposure is induction of the glutathione peroxidase system.

5. Fire Fighting Measures

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

FIRE AND EXPLOSION HAZARDS:

OXIDIZER. May accelerate pre-existing fire. May initiate fire/explosion in combustible materials. May react explosively with alkenes, aromatic compounds, bromine, combustible gases, diethyl ether, hydrogen bromide, hydrogen iodide, isopropylidene compounds, and other oxidizable materials.

EXTINGUISHING MEDIA:

Any, use media appropriate for surrounding fire.

FIRE FIGHTING INSTRUCTIONS:

Stop the flow of gas which is supporting the fire if it can be done without risk. Continue to cool fire exposed containers until well after flames have been extinguished. Firefighters should wear a NIOSH/MSHA approved full-facepiece self-contained breathing apparatus (SCBA) operated in positive pressure mode and full turnout gear.

6. Accidental Release Measures

Evacuate all personnel from affected area. A leak may present a fire/explosion hazard. Eliminate all ignition sources. Appropriate protective equipment is essential to prevent a toxic exposure. Clean-up personnel should be aware of the health and fire hazards associated with an ozone leak. REMOVE ALL OXIDIZABLE MATERIALS FROM CONTAMINATED AREA. 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 nearest BOC location.

7. Handling and Storage

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 120°F (49°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. Post "OXIDIZER - NO SMOKING OR OPEN FLAMES" signs in the storage or use area. Open storage preferred. Isolate from combustible and oxidizable materials. There should be no sources of ignition in the storage or use area. For additional storage recommendations, consult Compressed Gas Association's Pamphlet P-1.

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 (less than 3000 psig) 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.

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.
Do not use or store near oxidizable and combustible materials.

Electrical Classification:
No Data

8. Exposure Controls, Personal Protection

INGREDIENT	% VOLUME	PEL-OSHA[1]	TLV-ACGIH[2]	LD_{50} or LC_{50} Route/Species
Ozone FORMULA: O_3 CAS: 10028-15-6 RTECS #: RS8225000	100	0.1 ppm	0.1 ppm (Ceiling)	LC50: 4800 ppb/4 H inhalation/rat

[1] As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)
[2] Refer to individual state of provincial regulations, as applicable, for limits which may be more stringent than those listed here.
[3] As stated in the ACGIH 1996-97 Threshold Limit Values for Chemical Substances and Physical Agents. Ozone is on the "Notice of Intended Changes" with a TLV of: 0.05 ppm for heavy work; 0.08 ppm for moderate work; and 0.10 ppm for light work.

ENGINEERING CONTROLS:
Hood with forced ventilation for small quantities.

EYE/FACE PROTECTION:
Gas tight goggles, as necessary to prevent irritation.

SKIN PROTECTION:
Protective gloves as required for the job.

RESPIRATORY PROTECTION:
Under normal working conditions, below acceptable exposure guidelines, none required. For ozone concentrations greater or equal to 5 ppm, a NIOSH/MSHA approved full-facepiece SCBA or full-facepiece supplied-air respirator may be worn.

OTHER/GENERAL PROTECTION:

Safety shoes are recommended.

9. Physical and Chemical Properties

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Gas	
Vapor pressure at 100 °F	: > 1 atm	
Vapor density (Air = 1)	: 2.144 g/l @ 0 °C	(gas)
Evaporation point	: Not Applicable	
Boiling point	: -169	°F
Freezing point	: -315	°F
pH	: Not Available	
Specific gravity @ 70 °F	: Not Available	
Oil/water partition coefficient	: Not Available	
Solubility (H_20)	: 0.001% (@ 32 °F)	
Odor threshold	: Not Available	
Odor and appearance	: Colorless to blue gas with very pungent odor	

10. Stability and Reactivity

STABILITY:
Stable. Ozone is a strong oxidizer. Oxidation evolves more heat and generally starts at a lower temperature than oxidation with biatomic oxygen.

INCOMPATIBLE MATERIALS:
ALL OXIDIZABLE MATERIALS. Both organic and inorganic.

HAZARDOUS DECOMPOSITION PRODUCTS:
None known.

HAZARDOUS POLYMERIZATION:
Will not occur.

11. Toxicological Information

Patchy damage of the ciliated cells of the upper airway have been seen in various experimental animals following exposure to 0.2 to 0.5 ppm ozone for 7 days (8 to 24 H/day).

Human inhalation of 80 ppb/6.6 H ozone resulted in cough, respiratory depression and other changes.

NIOSH considers a 5 ppm concentration of ozone “Immediately Dangerous to Life and Health(IDLH)”.

CHRONIC: Immunosuppression has been reported in mice and guinea pigs (but not in humans) exposed to low levels of ozone. Chronic exposure to ozone has resulted in bronchiolitis and bronchitis in animals exposed daily to concentrations slightly greater than 1 ppm for 6 hours per day for 1 year.

OTHER: While ozone has had experimental teratogenic, genotoxic, oncogenic, and mutagenic effects, the extreme reactivity, gaseous nature, and toxicity of ozone present confounding influences in many of these tests. Ozone concentrations must be carefully regulated to allow detection of mutagenicity in the absence of extreme toxicity and

ozone concentrations tend to fluctuate or drop (as ozone is highly labile) over the period of a few hours to produce ineffective exposures. Due to confounding factors, studies are still inconclusive.

12. Ecological Information

FATE: Formed from reaction between atomic oxygen and molecular oxygen, ozone is the principal oxidizing agent of photochemical smog.

13. Disposal Considerations

Recycle, reclaim and dispose of in accordance with applicable local, state, and federal regulations. Dispose per 40 CFR Part 261 and 262.

14. Transport Information

PARAMETER	United States DOT	Canada TDG
PROPER SHIPPING NAME:	Compressed gases, toxic, n.o.s. (Ozone)	Compressed gases, toxic, n.o.s. (Ozone)
HAZARD CLASS:	2.3	2.3
IDENTIFICATION NUMBER:	UN 1955	UN 1955
SHIPPING LABEL:	POISON GAS, OXIDIZER	POISON GAS, OXIDIZER

15. Regulatory Information

SARA HAZARD CLASSES:
Sudden Release of Pressure Hazard
Fire Hazard
Acute Health Hazard
Chronic Health Hazard

SARA TITLE III - SECTION 302, EHS:
Ozone is listed as an Extremely Hazardous Substance (EHS) under Section 302 of SARA Title III with a Threshold Planning Quantity (TPQ) of 100 pounds. The presence of ozone in quantities in excess of the TPQ requires certain emergency planning activities to be conducted.

SARA TITLE III - SECTION 304, EHS:
Releases of ozone in quantities equal to or greater than the EHS Reportable Quantity (RQ) of 1 pound are subject to reporting to the National Response Center under Section 304.

SARA TITLE III - SECTION 313 SUPPLIER NOTIFICATION:
Ozone is a toxic chemical subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372. This information must be included on all MSDSs that are copied and distributed for this material.

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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