

Applications Note OS-102

Material Safety Data Sheet

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OZONE
(Revision B)

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SECTION 1. MATERIAL IDENTIFICATION

MATERIAL NAME: OZONE

DESCRIPTION (Origin/Use): Obtained by passing air between two plate electrodes connected to an alternating current source of several thousand volts. Frequently generated by electronic equipment. Used as an air and water disinfectant; for bleaching textiles, oils, and waxes; and in organic synthesis.

OTHER DESIGNATIONS: Triatomic Oxygen; O₃; NIOSH RTECS #RS8225000; CAS #10028-15-6

MANUFACTURER/SUPPLIER: Available from several suppliers, including:
PCI Ozone Corp., One Fairfield Crescent, West Caldwell, NJ 07006;
Telephone: (201) 575-7052

COMMENTS: Ozone is a severe respiratory hazard.

HMS

H 1

F 2

R 1

PPE*

* See sect. 8

Not Found

R 1

I 4

S 1

K 0

SECTION 2. INGREDIENTS AND HAZARDS

Ozone, CAS #10028-15-6; NIOSH RTECS #RS8225000

%

100

HAZARD DATA

ACGIH Values 1987-88

TLV-TWA: 0.1 ppm, 0.2 mg/m³*

TLV-STEL: 0.3 ppm, 0.6 mg/m³

OSHA PEL 1986 (29 CFR 1910, Subpart Z)

8-Hr TWA: 0.1 ppm, 0.2 mg/m³

IDLH** Level: 10 ppm

TOXICITY DATA

Human, Inhalation, TC_{Lo}: 600 ppb/2 Hrs

Human, Inhalation, TC_{Lo}: 0.2 ppm/3 Hrs

Human, Inhalation, TC_{Lo}: 100 ppm/1 Min

Man, Inhalation, TC_{Lo}: 1860 ppb/75 Min

**Immediately dangerous to life or health.

*This TLV-TWA is set to prevent ostensible or manifest injury; yet, sufficiently prolonged continual daily repeated eight-hour exposures may result in premature aging in a manner similar to that from exposure to ionizing radiation.

SECTION 3. PHYSICAL DATA

Boiling Point ... -169.42°F (-111.9°C)

Vapor Pressure ... >1 atm

Water Solubility ... Negligible

Density of Gas (Air = 1) ... 1.6

Melting Point ... -315.4°F (-193°C)

% Volatile by Volume ... 100

Molecular Weight ... 48 Grams/Mole

pH ... Not Listed

Critical Temperature ... 102.2°F (-12.1°C)

Appearance and odor: Blue-colored gas or liquid; characteristic odor often associated with electrical sparks or lightning in concentrations of less than 2 ppm.

COMMENTS: The pungent characteristic odor of ozone is detectable above 0.01 ppm and becomes disagreeable (sulfurlike) above 1 to 2 ppm. CAUTION: Olfactory fatigue develops rapidly, so do not use odor as a preventative warning device.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air	LOWER	UPPER
Not Available	Not Available	% by Volume	Not Listed	Not Listed

EXTINGUISHING MEDIA: Use large amounts of water spray or fog to put out fires involving ozone. This material increases the intensity of combustion as compared to the burning or exploding of material in air or with a comparable amount of oxygen gas, O₂ (g). Use appropriate fire-fighting techniques to deal with the surrounding material.

UNUSUAL FIRE/EXPLOSION HAZARDS: CAUTION: Ozone is a powerful oxidizing agent, and during fires or heated conditions solutions containing ozone explode when warmed.

SPECIAL FIRE-FIGHTING PROCEDURES: Wear self-contained breathing apparatus with full facepieces operated in a pressure-demand or other positive-pressure mode.

SECTION 5. REACTIVITY DATA

Ozone is not stable. Hazardous polymerization cannot occur.

CHEMICAL INCOMPATIBILITIES: Ozone is chemically incompatible with all oxidizable materials, both organic and inorganic.

CONDITIONS TO AVOID: Avoid ignition sources such as heat, sparks, and open flame. Ozone is unstable at ordinary temperatures because it spontaneously decomposes to oxygen gas. Keep it away from heat, flame, strong reducing agents, and combustible materials such as grease, oils, and fats.

PRODUCTS OF HAZARDOUS DECOMPOSITION: Ozone spontaneously decomposes to oxygen gas even at ordinary room temperatures.

SECTION 6. HEALTH HAZARD INFORMATION

Ozone is not listed as a carcinogen by the NTP, IARC, or OSHA.

SUMMARY OF RISKS: High concentrations of ozone may cause severe irritation of the eyes and respiratory tract. Exposure above 0.1 ppm causes the mucous membranes of the mouth, nose, and throat to dry. A short exposure at 1 to 2 ppm causes headache as well as irritation to the respiratory tract, but these symptoms subside when the exposure ends. High concentrations and/or repeated or prolonged exposures above the ACGIH/OSHA exposure limits produce nausea, chest pain, coughing, dyspnea, fatigue, reduced visual acuity, and pulmonary edema. **CAUTION:** Inhalation of >20 ppm for at least 1 hour (or 50 ppm for at least 1/2 hour) may be fatal. Symptoms of pulmonary edema may be significantly delayed (one or more hours) from the time of initial exposure. Toxic effects reported include eye, skin, and CNS effects.

TARGET ORGANS: Respiratory system, eyes. **PRIMARY ENTRY:** Inhalation. **ACUTE EFFECTS:** The acute damage from ozone appears to be the result of its oxidizing effect upon contact with tissue. The acute effects of ozone inhalation include eye irritation, mucous membrane irritation, and pulmonary edema. **CHRONIC EFFECTS:** Respiratory disease. Deleterious (ozone inhalation) effects on the lungs and acceleration of tumors have been reported as chronic effects on exposure to ozone. **MEDICAL CONDITIONS AGGRAVATED BY LONG-TERM EXPOSURE:** Workers with a history of heart or lung problems must be prevented from industrial exposure to ozone. Individual susceptibility to injuries from ozone varies significantly. Because of a certain enzyme deficiency, particular persons may become ill from ozone exposures that are readily endured by workers without this condition. **FIRST AID: EYE CONTACT:** Flush eyes, including under the eyelids, promptly and gently with plenty of running water for 15 minutes. Get medical help. **SKIN CONTACT:** Skin contact with cryogenic liquid ozone will cause severe frostbite or freeze burns to dermal layers. Prolonged or repeated skin contact will increase the severity or depth of these burns. Get medical help. **INHALATION:** Remove victim to fresh air; restore and/or support his breathing as needed. Move victim to a 100% oxygenated atmosphere. Get medical help. **INGESTION:** As a gas or cryogenic liquid, ozone is unlikely to be ingested.

* GET MEDICAL ASSISTANCE = IN PLANT, PARAMEDIC, COMMUNITY. Get prompt medical assistance for further treatment, observation, and support after first aid.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

SPILL/LEAK: Before using ozone, it is essential that proper emergency procedures be established and made known to all personnel involved in handling it. Use approved NIOSH respirators in emergency/IDLH conditions. Ozone leaks may be detected by exposing paper impregnated with dried 4% potassium iodide to the suspected leak. If the paper turns brown, it is an indication that ozone is present.

DISPOSAL: Provide ventilation to dilute and disperse small amounts of ozone into the outside atmosphere. Follow Federal, state, and local regulations.

Ozone is not designated as a hazardous substance by the EPA (40 CFR 116).

Ozone is reported in the 1980 EPA TSCA Inventory.

EPA Hazardous Waste Number (40 CFR 261): Not Listed

EPA Reportable Quantity: Not Listed

Aquatic Toxicity TLm: Not Listed

Ozone is an OSHA Air Contaminant (29 CFR 1910.1000, Subpart Z: Table Z-1).

SECTION 8. SPECIAL PROTECTION INFORMATION

GOGGLES: Wear protective eyeglasses or chemical safety goggles.

GLOVES: Wear impervious gloves made of neoprene or rubber with fully protective gauntlets to protect against frostbite or freeze burns from cryogenic liquid ozone.

RESPIRATOR: For IDLH/unknown concentrations, use a self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure modes.

OTHER EQUIPMENT: Wear rubber boots, protective aprons, and other protective clothing to prevent any possible skin contact with liquid ozone that would result in frostbite/freeze burns.

VENTILATION: Provide general and local exhaust ventilation to meet ACGIH exposure values. Provide ventilation to dilute and disperse small amounts of ozone into the outside atmosphere. Ozone is highly toxic, and properly maintained engineering ventilation systems are crucial to a safe work environment.

SAFETY STATIONS: Make eyewash stations, washing facilities, and safety showers available in areas of use and handling. Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them.

SPECIAL CONSIDERATIONS: See Calabrese et al., *J. Toxicol. Health* [1977] 2:709.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

STORAGE SEGREGATION: Prevent ozone from coming into direct physical contact with strong acids or bases or with strong oxidizing/reducing agents. **SPECIAL HANDLING/STORAGE:** Ozone can be stored for prolonged periods as a liquid under cryogenic conditions. **CAUTION:** Solutions containing ozone can explode when warmed. Also, some products of reaction such as ozonides formed from unsaturated hydrocarbons may be highly explosive. **ENGINEERING CONTROLS:** Install ventilation systems that are able to maintain ozone use concentrations below the ACGIH/OSHA exposure limits (see sect. 2).

Minimize or eliminate all sources of ignition such as open flame or sparks.

OTHER PRECAUTIONS: Where ozone is generated (or where liquid ozone is stored or used), explosion hazards exist and must be avoided by proper planning, equipment, engineering systems, training, and work practices.

TRANSPORTATION DATA (per 49 CFR 172.101-2):

DOT Hazard Class: Poison A

DOT ID No. NA1953

IMO Class: 2.3

IMO Required Label: Poison Gas

DOT Shipping Name: Poisonous Gas, Flammable, NOS

DOT Required Label: Poison Gas and Flammable Gas

References: 2, 4-9, 12, 14, 16, 17, 27, 31, 37, 38, 73, 87-94. PI

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Approvals *JO DeRocio*

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