

# SAFETY DATA SHEET for OZONE

(Formerly MSDS)

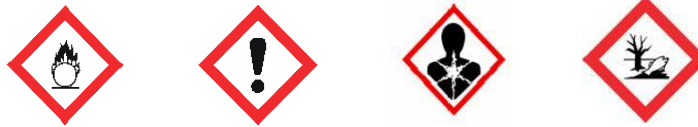
## 1. PRODUCT IDENTIFICATION

**Product Name:** Ozone**Common Names/Synonyms:** Triatomic Oxygen, Trioxygen, O<sub>3</sub>**Ozone Generator Manufacturer/Supplier**

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**Product Use:** This SDS is limited to ozone produced in gaseous form on site by an ozone generator, in varying concentrations in either air or aqueous solution, for the purposes of odor abatement, oxidation of organic compounds, or antimicrobial intervention, in a variety of applications, from food processing to ground water remediation.

## 2. HAZARD IDENTIFICATION



GHS Classifications:

Physical Hazards	Health Hazards	Environmental Hazards
Oxidizing Gas	Skin Irritation – Category 3	Acute Aquatic Toxicity – Category I
	Eye Irritation – Category 2B	
	Respiratory Systemic Toxicity – Category 1 (Acute & Repeated Exposures)	

NOTE: Severe respiratory toxicity will develop before skin or eye irritation go beyond listed categories. *Anyone with chronic pulmonary problems, especially asthma, should avoid exposure to ozone.*

WHMIS Classifications (Workplace Hazardous Materials Information System, Canada)

D1A	Acute lethality – Very toxic, immediately	C	Oxidizing
D2A	Chronic Toxicity – Very Toxic	F	Dangerously Reactive
D2B	Mutagenicity – Toxic		

## 3. COMPOSITION

Chemical name Ozone  
 Common names Triatomic oxygen, trioxygen  
 Chemical Formula O<sub>3</sub>  
 CAS Registry Number 10028-15-6

#### 4. FIRST AID MEASURES

Route of Entry		Symptoms	First Aid
Skin Contact	YES	Irritation	Rinse with water
Skin Absorption	NO	NA	NA
Eye Contact	YES	Irritation	Rinse with water, remove contacts
Ingestion	NO	NA	NA
Inhalation	YES	Headache, cough, dry throat, heavy chest, shortness of breath	Remove to fresh air, provide oxygen therapy as needed

*For severe cases, or when symptoms don't improve, seek medical help.*

#### 5. FIRE FIGHTING MEASURES

While ozone itself is not flammable, it is a strong oxidant and may accelerate, even initiate, combustion, or cause explosions. Use whatever extinguishing agents are indicated for burning materials.

#### 6. ACCIDENTAL RELEASE MEASURES

Turn off ozone generator, and ventilate the area. Evacuate the area until ozone levels subside.

#### 7. HANDLING AND STORAGE

Ozone must be contained within ozone-resistant tubing and pipes from the generation point to the application point. Any leaks must be repaired before further use.

#### 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OSHA Permissible Exposure Limit: 8 hour Time Weighted Average **0.1 ppm**

ANSI/ASTM: 8 hour TWA **0.1 ppm**, Short Term Exposure Limit **0.3 ppm**

ACGIH: 8 hour TWA **0.1 ppm**; STEL **0.3 ppm**

NIOSH: Exposure Limit Ceiling Value **0.1 ppm** light; **0.08 ppm** moderate; **0.05 ppm**, heavy;

Light, moderate, heavy work TWA  $\leq$  2 hours, **.2 ppm**

Immediately Dangerous to Life or Health **5 ppm**

**Respiratory Protection:** Use full face self-contained breathing apparatus for entering areas with high concentration of ozone.

**Engineering controls:** use ozone destruct units (thermal and/or catalytic) for off gassing ozone.

#### 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state	Gas	pH	NA
Molecular Weight	48.0	Flash point	NA
Appearance	Clear at low concentrations, blue at higher concentrations	Evaporation rate	NA
Odor	Distinctive pungent odor	Flammability	NA
Odor threshold	0.02 to 0.05 ppm; exposure desensitizes	Explosive limits	NA

Melting point	-193°C/-315°F	Relative density	NA
Boiling point	-112°C/-169°F	Partition coefficient	NA
Vapor pressure	> 1 atm	Auto-ignition temperature	NA
Vapor density	1.6 (air = 1)	Decomposition temperature	NA
Solubility in water	570 mg/L @20°C, 100% O <sub>3</sub> ; 0.64 @0°C (vol/vol)	Viscosity	NA

### 10. STABILITY AND REACTIVITY

Ozone is highly unstable and highly reactive. Avoid contact with oxidizable substances, including alkenes, benzene and other aromatic compounds, rubber, dicyanogen, bromine diethyl ether, dinitrogen tetroxide, nitrogen trichloride, hydrogen bromide, and tetrafluorohydrazine. Ozone will readily react and spontaneously decompose under normal ambient temperatures.

### 11. TOXICOLOGICAL INFORMATION

Likely routes of exposure: inhalation, eyes, skin exposure.

Effects of Acute Exposure: Discomfort, including headache, coughing, dry throat, shortness of breath, heavy feeling in chest (including possible pulmonary edema/fluid in the lungs); higher levels of exposure intensify symptoms. Irritation of skin and/or eyes is also possible.

Effects of Chronic Exposure: Similar to acute exposure effects, with possible development of chronic breathing disorders, including asthma.

Inhalation LC<sub>50</sub>: mice, 12.6 ppm for 3 hours; hamsters, 35.5 ppm for 3 hours

Irritancy of Ozone	YES
Sensitization to Ozone	NO
Carcinogenicity (NTP, IARC, OSHA)	NO
Reproductive Toxicity	Not Proven
Teratogenicity	Not Proven
Mutagenicity	Not Proven
Toxicologically Synergistic Products	Increase susceptibility to allergens, pathogens, irritants

### 12. ECOLOGICAL INFORMATION

The immediate surrounding area may be adversely affected by an ozone release, particularly plant life. Discharge of ozone in water solution would also be harmful to any aquatic life. Due to natural decomposition, bioaccumulation will not occur, and the area affected would be limited.

### 13. DISPOSAL CONSIDERATIONS

Off-gassing of ozone should be through an ozone destruct unit which uses heat and/or a catalyst to accomplish the breakdown of ozone to oxygen before release into the atmosphere.

### 14. TRANSPORT INFORMATION

NOT APPLICABLE, as ozone is unstable and either reacts with other substances in the environment or decomposes, and therefore must be generated at the location and time of use.

## 15. REGULATORY INFORMATION

SARA = Superfund Amendments and Renewal Act

SARA Title III Section 302 Extremely Hazardous Substance TPQ: 100 lbs.

SARA Title III Section 304, EHS RQ: 100 lbs.

SARA Title III Section 313: Ozone is reportable if more than 10,000 lbs. are used/year.

TPQ (Threshold Planning Quantity) requires emergency planning activities if this amount is on site at any time during year

RQ (Reportable Quantity) requires any release of this amount into the environment to be reported to the National Response Center

Source: EPA List of Lists

## 16. OTHER INFORMATION

The half-life of ozone is much shorter in water than in air. Increased temperature in either solvent decreases the half-life. Published research indicates a half-life of 20 minutes for ozone dissolved in water at 20°C, and a half-life of approximately 25 hours for ozone in dry air at 24°C (McClurkin & Maier, 2010). The practical half-life time is actually less, especially in air, due to air circulation, humidity, the presence of contaminants or walls with which to react, etc. In many situations, with air movement, warmer temperatures, and normal relative humidity, the half-life of ozone in air could be 1 hour or less. Further, ventilation of a closed space to other areas will also disperse the ozone, so that concentration levels can rapidly decrease after generation ceases.

Source websites:

Canadian Centre for Occupational Health and Safety: Chemical Profiles: Ozone

[http://www.ccohs.ca/oshanswers/chemicals/chem\\_profiles/ozone/](http://www.ccohs.ca/oshanswers/chemicals/chem_profiles/ozone/)

Haz-Map: Occupational Exposure to Hazardous Agents: Ozone

<http://hazmap.nlm.nih.gov/category-details?id=68&table=copytblagents>

International Chemical Safety Cards #0068: Ozone

<http://www.cdc.gov/niosh/ipcsneng/neng0068.html>

NIOSH Pocket Guide to Chemical Hazards: Ozone <http://www.cdc.gov/niosh/npg/npgd0476.html>

United States National Library of Medicine ChemIDplus Lite: Ozone 10028-15-6

<http://chem.sis.nlm.nih.gov/chemidplus/ProxyServlet?objectHandle=DBMaint&actionHandle=default&nextPage=jsp/chemidlite/ResultScreen.jsp&TXTSUPERLISTID=0010028156>

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