SAFETY DATA SHEET for AQUEOUS OZONE (0.1 to 2.0 PPM)

SECTION 1 – IDENTIFICATION OF THE MIXTURE AND OF THE COMPANY

1.1 PRODUCT IDENTIFIER: Aqueous Ozone (Concentration 0.1 to 2.0 PPM)
Common Names/Synonyms: Aqueous Ozone, Ozone Dissolved in Water
Ozone Generator Manufacturer/Supplier

1.2 RELEVANT IDENTIFIED USES OF THE MIXTURE AND USES ADVISED AGAINST

This SDS is limited to Aqueous Ozone generated electrolytically at point of use by Enozo aqueous ozone generators, in varying concentrations in aqueous solution, for the purposes of odor abatement, oxidation of organic compounds, or antimicrobial intervention, in a variety of applications when used as directed.

1.3 DETAILS OF THE SUPPLIER OF THE SAFETY DATA SHEET

Enozo Technologies, Inc.
300 Willow Street
North Andover, MA 01845
website: www.enozo.com
email: info@enozo.com

1.4 EMERGENCY TELEPHONE NUMBER

1-978-233-4840 (9 – 5 pm EST)

SECTION 2 – HAZARDS IDENTIFICATION

2.1 CLASSIFICATION OF THE MIXTURE

2.1.1 Classification according to Regulation (EC) No 1272/2008 (CLP)
The mixture generated by the device (aqueous ozone) does not meet the criteria for classification as a hazard

2.1.2 Additional information:
None

2.2 LABEL ELEMENTS

None

2.3 OTHER HAZARDS

None

SECTION 3 – COMPOSITION / INFORMATION ON INGREDIENTS

Name	**Identifier**	**% present in any formulation #**	**Classification according to Regulation (EC) No 1278/2008 (CLP)**
Water	Cas No: 7732-18-5 EC No: 231-791-2 REACH registration No: exempt	>99.9998%	Not classified
Ozone	Cas No: 10028-15-6 EC No: 233-069-2 REACH registration No: exempt, biocidal product	<0.0002%	Ox. Gas 1, H270 Acute Tox. 1, H330 Muta. 2, H341 Carc. 2, H351 STOT SE 1, H370 STOT SE 3, H335 STOT RE 1, H372

Note that the % of ozone generated in the aqueous mixture does not require classification. This

product does not generate ozone gas. See section 16 for the description of the H phrases.

SECTION 4 - FIRST AID MEASURES

4.1 DESCRIPTION OF FIRST AID MEASURES

IF INHALED: Remove person to fresh air and keep comfortable for breathing provide oxygen therapy as needed. Call a POISON CENTER/Doctor if you feel unwell.
IF ON SKIN: Wash affected area with plenty of water. If skin irritation occurs: Get medical advice/attention.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
IF SWALLOWED: Drink clean water to dilute product

4.2 MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

ACUTE:
Not expected to cause any skin, eye or gastro intestinal irritation following contact. If inhaled not expected to cause headache, cough dry throat, heavy chest or shortness of breath,

4.3 INDICATION OF ANY IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED

none

SECTION 5 - FIRE FIGHTING MEASURES

5.1 EXTINGUISHING MEDIA:

Aqueous Ozone itself is not flammable, it is a mild oxidant. The dispensed mixture will not initiate, combust, or cause explosions. Use whatever extinguishing agents are indicated for burning materials.

5.2 SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OF MIXTURE:

None identified

5.3 ADVICE FOR FIREFIGHTERS

No specific requirements

SECTION 6 - ACCIDENTAL RELEASE MEASURES

6.1 PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT, AND EMERGENCY PROCEDURES:

Ensure the area is adequately ventilated. Discontinue use and evacuate the area if irritation is detected. Ensure the correct protective equipment is worn, as described in section 8.

6.2 ENVIRONMENTAL PRECAUTIONS

Avoid washing spillage down domestic drains or areas prior to diluting with more water.

6.3 METHODS AND MATERIAL FOR CONTAINMENT AND CLEAN-UP:

Clean up with absorbent material.

6.4 REFERENCE TO OTHER SECTIONS

Protective equipment is described in section 8.
See Section 2 for Hazards Identification. See Section 4 for First Aid Measures. See Section 5 for Fire Fighting Information.

SECTION 7 - HANDLING AND STORAGE

7.1 PRECAUTIONS FOR SAFE HANDLING:

Use only with adequate ventilation.
Avoid contact with eyes and skin. Do not eat, drink or smoke in work areas. Wash hands after use.

7.2 CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES:

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.

7.3 SPECIFIC END USE(S):

To be used only for the purposes described in the instructions

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 CONTROL PARAMETERS:

Ozone gas

DNELs	Workers				Consumers			
Route of exposure	Acute effect local	Acute effect systemic	Chronic effects local	Chronic effects systemic	Acute effect local	Acute effect systemic	Chronic effects local	Chronic effects systemic
inhalation	No hazard identified		0.024 mg/m³	No hazard identified	No hazard identified			
dermal	irritation	No hazard identified			No hazard identified			
eyes	medium hazard, no threshold identified				No hazard identified			

The PNEC for freshwater and marine water is 0.008 µg/L

8.2 EXPOSURE CONTROLS:

8.2.1 Appropriate engineering controls

Must not be handled in a confined space without sufficient ventilation**.** Use ozone destruct units (thermal and/or catalytic) for off gassing ozone.

8.2.2 Individual protection measures, such as personal protective equipment (PPE):

Eyes and Face: The product from Aqueous Ozone generators should not contain sufficient ozone to be irritating,
Skin: Protective chemical gloves are recommended.
Respiratory: No self-contained breathing apparatus is required for areas with low concentration of ozone. Aqueous Ozone generators are expected to off gas Ozone at levels below hazardous exposure limits.
Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Practice good housekeeping.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Ozone:

Appearance	Gas, Clear at low concentrations, Blue at higher concentrations
Odor	Distinctive pungent odor; No fragrance added
Odor Threshold	0.02 to 0.05 ppm; exposure desensitizes
pH	6.5 – 9.5
Melting point/Freezing point	-193ºC/-315ºF
Initial Boiling Point and Boiling Range	-112ºC/-169ºF
Flash Point	not applicable
Evaporation Rate	not applicable
Flammability	not applicable
Upper / Lower Flammability or Explosive Limits	not applicable
Vapor Pressure	> 1 atm
Vapor Density	1.6 (air = 1)
Relative Density/Specific Gravity (at 60°F)	not applicable
Solubility in Water	570 mg/L @20ºC, 100% O_3; 0.64 @0ºC (vol/vol)
Partition Coefficient; n-octanol /water	not determined
Auto-ignition Temperature	not determined
Decomposition temperature	not determined
Viscosity	not applicable
Pour Point	not applicable

SECTION 10 - STABILITY AND REACTIVITY

10.1 REACTIVITY: Aqueous Ozone is not known to be readily reactive. Aqueous Ozone will readily react and spontaneously decompose in 10 – 20 minutes leaving no known hazardous bi-products.

10.2 CHEMICAL STABILITY: This material is not stable and will spontaneously decompose in 10 – 20 minutes leaving no known hazardous bi-products.

10.3 POSSIBILITY OF HAZARDOUS REACTION: none identified

10.4 CONDITIONS TO AVOID: none identified

10.5 INCOMPATIBLE MATERIALS: none identified

10.6 HAZARDOUS DECOMPOSITION PRODUCTS: No dangerous reactions are known when used as directed.

SECTION 11 - TOXICOLOGICAL INFORMATION

Please note that the ozonized water is not considered hazardous.

The device does not release sufficient ozone gas into the air to be hazardous but the following describes the toxicology of ozone gas.

ACUTE TOXICITY: LC_{50} = 3.6 ppm (equals 7.06 mg/m^3)
SKIN CORROSION/IRRITATION. The gas is corrosive to the skin and eyes. Ozone concentrations between 2 mg/m3 and 10 mg/m3 trigger injuries of the conjunctiva and the mucosae of the upper respiratory tract as well as of the alveolar epithelium even after short exposure durations (severe lacrimation, changes of the visual acuity, disorders of the respiratory function, cyanosis and toxic lung edema)
SKIN SENSITIZATION: Not expected to be a skin sensitizer.
GERM CELL MUTAGENICITY: Not expected to cause heritable genetic effects.
CARCINOGENICITY– Ozone gas is considered to be a mutagenic carcinogen.
REPODUCTIVE TOXICITY: ozone gas is not classified for reproductive toxicity
TERATOGENICITY/EMBRYOTOXICITY: ozone gas is not classified for reproductive toxicity
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE): Respiratory tract irritation, difficulty breathing
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE): Repeated inhalation exposure may result in damage to the respiratory tract.
ASPIRATION HAZARD: not applicable.

SECTION 12 - ECOLOGICAL INFORMATION

12.1 TOXICITY: Ozone: Aquatic Acute 1: All LC50 values for fish and invertebrates were substantially lower than 1 mg/l, the upper limit for classification of a substance for acute aquatic toxicity in category 1. Aquatic Chronic 1 $NOEC_{chronic}$ for ozone in fish is ca. 2 µg/L.

12.2 PERSISTENCE AND DEGRADABILITY: inherently biodegradable.

12.3 BIOACCUMULATIVE POTENTIAL: Not applicable.

12.4 MOBILITY IN SOIL: Not applicable

12.5 RESULTS OF PBT AND vPvB ASSESSMENT: Ozone is an inorganic substance and therefore PBT and vPvB criteria are not applicable. Degradation or transformation products of ozone are as well inorganic (oxygen, short lived OH-radicals) and not relevant for PBT assessment.

12.6 OTHER ADVERSE EFFECTS: No information available.

SECTION 13 - DISPOSAL CONSIDERATIONS

13.1 WASTE TREATMENT METHODS

13.1.1 Product/Packaging disposal
Generating devices should be disposed of properly following manufacturer's directions. Ozone will naturally decay back to oxygen and not reach dangerous levels when used as directed in Enozo Electrolytic ozone generators.
13.1.2 Waste treatment
Dilute product prior to disposing of in domestic waste
13.1.3 Sewage disposal
Not applicable
13.1.14 Other disposal recommendations
none

SECTION 14 - TRANSPORTATION INFORMATION

NOT APPLICABLE, as ozone is not transported. It 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. Only the Aqueous Ozone generator device is transported.

SECTION 15 - REGULATORY INFORMATION

15.1 SAFETY, HEALTH AND ENVIRONMENTAL REGULATIONS/LEGISLATION SPECIFIC FOR THE MIXTURE

The aqueous ozone produced by this device is a biocidal product and subject Regulation (EU) 528/2012

15.2. CHEMICAL SAFETY ASSESSMENT

Not prepared for this mixture

SECTION 16 – OTHER INFORMATION

The decay rate of aqueous ozone is a function of temperature and exposure to organic material. The half life of ozone in water is approximately 10 to 20 minutes. Ozone begins to lose its oxidizing strength from the moment of generation, thus, on-demand ozone generation is necessary. The ultra compact electrolytic ozone generator contained in the product produces very low levels of ozone concentration that are sufficient to address bacteria and pathogens claimed when the device is used as directed.

Source websites:

Canadian Centre for Occupational Health and Safety: Chemical Profiles: Ozone
http://www.ccohs.ca/oshanswers/chemicals/chem_profiles/ozone/

Haz-Map: Occupational Exposure to Hazardous Agents: Ozone
http://hazmap.nlm.nih.gov/cgi-bin/hazmap_generic?tbl=TblAgents&id=68

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

Wording of the H in section 3
H270 - May cause or intensify fire; oxidizer.
H330 - Fatal if inhaled.
H341 - Suspected of causing genetic defects.
H370 - Causes damage to organs (lungs).
H335 - May cause respiratory irritation.
H372 - Causes damage to organs through prolonged or repeated exposure (inhalation).

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