Section 1: Product and Company Identification

Product Name: Osmium Tetroxide, 2% aqueous
Synonym: Osmic Acid Solution, Osmium (VIII) Oxide
Company Name: Ted Pella, Inc., P.O. Box 492477, Redding, CA 96049-2477

Inside USA and Canada 1-800-237-3526 (Mon-Thu. 6:00AM to 4:30PM PST; Fri 6:00AM to 4:00PM PST)
Outside USA and Canada 1-530-243-2200 (Mon-Thu. 6:00AM to 4:30PM PST; Fri 6:00AM to 4:00PM PST)

CHEMTREC USA and Canada Emergency Contact Number 1-800-424-9300 24 hours a day
CHEMTREC Outside USA and Canada Emergency Contact Number +1-703-741-5970 24 hours a day

Section 2: Hazard Identification

2.1 Classification of the substance or mixture

GHS Pictograms

GHS05 GHS06 GHS07

GHS Categories
GHS05 – Corrosive
GHS06 – Toxic
  Acute tox, oral (5) H303: May be harmful if swallowed
  Acute tox, inhalation (3) H331: Toxic if inhaled
  Specific target organ tox (2) H370: Causes damage to organs
  Reproductive tox (2) H361: Suspected of damaging fertility or the unborn child.
GHS07 – Irritant
  Serious eye damage/irritation (1) H318: Causes serious eye damage
  Skin irritation (2) H315: Causes skin irritation

2.2 Label elements
Hazard pictograms

GHS06  GHS05  GHS07

Signal Word: DANGER

Hazard statements
H303: May be harmful if swallowed
H315: Causes skin irritation
H318: Causes serious eye damage
H331: Toxic if inhaled
H370: Causes damage to organs
H361: Suspected of damaging fertility or the unborn child

Precautionary statements
P202: Do not handle until all safety precautions have been read and understood
P210: Keep away from heat/sparks/open flames/hot surfaces – No smoking
P264: Wash thoroughly after handling
P280: Wear protective gloves/protective clothing/eye protection/face protection
P308+313: IF exposed or concerned: Get medical advice/attention.
P402: Store in a dry place.
P404: Store in a closed container.
P501: Dispose of contents/container in accordance with local/national/international rules.

2.3 Other hazards

Health Effects:
NFPA Hazard Rating: Health: 4; Fire: 0; Reactivity: 1
HMIS® Hazard Rating: Health: 4; Fire: 0; Reactivity: 1
(0=least, 1=Slight, 2=Moderate, 3=High, 4=Extreme)

Results of PBT and vPvB assessment
PBT: NA
vPvB: NA

Emergency overview
Appearance: Colorless to pale yellow solution.
Immediate effects: This substance can be absorbed into the body by inhalation of its vapors, by inhalation of its aerosol and by ingestion. May cause sensitization by inhalation and skin contact.
Target Organs: Eyes and Central Nervous System.
Potential health effects
Primary Routes of entry:
   Eyes: Likely
   Inhalation: Highly likely
   Skin: Likely
   Ingestion: Likely
Signs and Symptoms of Overexposure: ND
Eyes: Irritation, lacrimation, visual disturbance, conjunctivitis, headache, potential damage to cornea. If eyes are exposed to vapor over a short period of time, night vision
will be affected for about one evening. One will notice colored halos around lights.

Skin: Dermatitis, possible skin discoloration (green or black). Toxic if absorbed through the skin.

Ingestion: Toxic if swallowed. Irritation, cough, dyspnea, death.

Inhalation: Toxic if inhaled. Coughing, shortness of breath, unconsciousness, could cause tracheitis, bronchitis, bronchial spasm which may lead to inflammatory lesions of the lung.

Chronic Exposure: Potential Kidney damage. Laboratory test have shown mutagenic effects. Reproductive hazard.

Chemical Listed As Carcinogen or Potential Carcinogen: No

See Toxicological Information (Section 11)

Potential environmental effects

See Ecological Information (Section 12) See Toxicological Information (Section 11)

Section 3: Composition / Information on Ingredients

<table>
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<tr>
<th>Principle Hazardous Component(s)</th>
<th>OSHA PEL mg/m3</th>
<th>ACGIH TLV, mg/m3</th>
<th>ACGIH TLV- STEL, ppm</th>
<th>NTP Carcinogen</th>
<th>IARC Carcinogen</th>
<th>OSHA regulated Carcinogen</th>
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<tr>
<td>Osmium Tetroxide/Osmium Oxide</td>
<td>0.002</td>
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</tbody>
</table>

Section 4: First Aid Measures

If accidental overexposure is suspected

Eye(s) Contact: Flush for 15 minutes with plenty of water. Remove contact lenses if present and easy to do so. If discomfort occurs or persists, contact a physician.

Skin Contact: Immediately take off all contaminated clothing. Rinse thoroughly with water. Get medical advice if irritation develops or persists.

Ingestion: Rinse mouth. If swallowed give large quantities of water and induce vomiting unless person is unconscious. Get medical attention immediately.

Inhalation: Remove to fresh air immediately. If discomfort occurs or persists, contact a physician. If breathing has stopped, perform artificial respiration.

Note to physician

Treatment: ND

Medical Conditions generally Aggravated by Exposure: Any respiratory condition such as asthma will be aggravated. Potential kidney damage.

Section 5: Fire Fighting Measures

Flash Point: NA

Flammable Limits: NA

Auto-ignition point: NA

Fire Extinguishing Media: Water spray, carbon dioxide, and dry chemical.

Special Fire Fighting Procedures: Use NIOSH/MSHA approved self-contained breathing apparatus and full protective gear.

Unusual Fire and Explosion Hazards: Osmium tetroxide is a strong oxidizer and may react explosively with many organic compounds.

Hazardous combustion products: Emits toxic fumes under fire conditions.

DOT Class: Toxic, 6.1
Section 6: Accidental Release Measures
Steps to be Taken in Case Material is Released or Spilled

Personal precautions, protective equipment, and procedures
Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Eliminate ignition sources (no smoking, flares, sparks, or flames in immediate area). Wear appropriate protective equipment (SCBA) and clothing during clean-up. Avoid breathing dust. Ventilate area if easy to do so and wash the spill site after clean-up is complete. Contact local authorities if significant spills cannot be contained. For personal protection, see section 8 of this SDS.

Containment equipment and procedures
Large spills: Contain actively spilling material if safe and easy to do so. Avoid generating dust. Collect material and dispose of.
Small spills: Sweep and collect to waste receptacles.

Clean-up procedures
Collect all contaminated media or other cleanup materials into a waste receptacle. If cleaning surface is necessary, utilize vacuum cleaner, provided adequate ventilation is available.

Waste Disposal Methods: Dispose of waste according to Federal, State and Local Regulations.

Section 7: Handling and Storage
Precautions to be Taken in Handling and Storage
Storage:
Store sealed vials in a dry, cool area (refrigerator) with sufficient packaging to avoid accidental breakage. Do not store directly on ground. Do not store near combustible materials. Keep container upright. Store in a dry place.

Handling:
Use compatible chemical-resistant gloves. Wash hands thoroughly after handling. Avoid breathing dust or solution spray. Avoid contact with eyes. Avoid contact with skin and clothing. Have emergency SCBA or SAR. Use only with adequate ventilation. Wash hands before eating, drinking, or smoking.

Other Precautions:
0.1 mg/m3 supplied air respirator with a full face piece, any self-contained breathing apparatus with a full face piece. Any chemical cartridge respirator with a high efficiency particulate filter with a full face piece and cartridges providing protection against osmic acid. Any air-purifying full face piece respirator (gas mask) with a chin-style or front- or back-mounted canister providing protection against osmium tetroxide and having a high efficiency particulate filter. 1 mg/m3 any supplied air respirator with a full face piece and operated in a pressure-demand or other positive-pressure mode.

Emergency or planned entry in unknown concentration or immediately dangerous to life or health conditions. Any self-contained breathing apparatus with full face piece and operated in a pressure-demand or other positive-pressure mode. Any self-contained breathing apparatus.

Escape: Any air-purifying full face piece respirator (gas mask) with a chin-style or front- or back-mounted canister providing protection against osmium tetroxide and having a high efficiency particulate filter. Any appropriate escape type self-contained breathing apparatus.

Storage temperature: 2-8 degrees C.
Storage Pressure: ND

Section 8: Exposure Controls / Personal Protection

Engineering Controls
Ventilation required: Local Exhaust: Yes; Mechanical: Yes; Other: Fume Hood.

Personal Protection Equipment
Respiratory protection: 0.1 mg/m3 supplied air respirator with a full face piece.
Protective gloves: Rubber/Neoprene (use compatible chemical-resistant gloves).
Skin protection: Lab coat/apron, flame and chemical resistant protective clothing.
Eye protection: ANSI approved safety glasses/goggles or full face piece with respirator.
Additional clothing and/or equipment: eye wash, safety shower, and hygiene facilities for washing.

**Exposure Guidelines**
See Composition/Information on Ingredients (Section 3)

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**Section 9: Physical and Chemical Properties**
Appearance and Physical State: Colorless to pale yellow liquid.
Odor (threshold): Sharp chlorine like odor.
Chemical Type: Mixture
Specific Gravity (H2O=1): 1.04
Vapor Pressure (mm Hg): 63.591 mmHg
Vapor Density (air=1): NA
Percent Volatile by volume: ND
Evaporation Rate (butyl acetate=1): NE
Boiling Point: 100 °C
Melting point: 0 °C
pH: 6 – 7
Solubility in Water: 5g OsO₄/100 ml
Molecular Weight: 254.2
Chemical Formula: OsO₄ in H₂O.

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**Section 10: Stability and Reactivity**
Stability: Stable.
Conditions to Avoid: Elevated temperature, open flame and ignitions sources. Contact with Hydrochloric acid will cause formation of poisonous chlorine gas.
Materials to Avoid (Incompatibility): Strong reducing materials, organic materials, hydrochloric acid (contact will produce poisonous chlorine gas), bases, finely powdered metals and chlorine gas.
Hazardous Decomposition Products: None
Hazardous Polymerization: Will not occur.

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**Section 11: Toxicological Information**
Results of component toxicity test performed:

**Acute studies**
- Intraperitoneal-LD50: 13500 UG/kg (mouse)
- Oral-LD50: 162 mg/kg (mouse)
- Intraperitoneal-LD50: 14100 UG/kg (rat)

**Subchronic**

**Reproductive effects**
Species: Rat
Dose: 20336 UG/KG
Route of Application: Intratesticular
Exposure Time: (1D MALE)
Result: Paternal Effects: Spermatogenesis (including genetic material, sperm morphology, motility, and count), testes, epididymis, sperm duct.
Species: Mouse
Dose: 20336 UG/KG
Route of Application: Subcutaneous
Exposure Time: (30D MALE)
Result: Paternal Effects: Spermatogenesis (including genetic material, sperm morphology, motility, and count), testes, epididymis, sperm duct.

**Mutagenicity (genetic effects)**
Species: Hamster
Dose: 200 UMOL/L
Cell Type: Embryo

Human experience:
In low (not specified) levels of Osmium tetroxide (OsO4) caused irritation in the eyes, skin, nose and respiratory system. In high (not specified) levels, it may be corrosive to the eyes and the skin and also may cause systemic effects, pneumonia and lethality. Tolerated concentration: 0.001 mg/m3 for 6 hours. Repeated or prolonged contact with skin may cause dermatitis. The substance may cause effect on the kidney.

**Carcinogenicity**
This product does not contain any compounds listed by NTP or IARC or regulated by OSHA as a carcinogen.

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**Section 12: Ecological Information**
Ecological Information: This substance may be hazardous to the environment; special attention should be given to Crustaceans. Do not allow large quantities to reach ground water, water courses or sewer systems.
Chemical Fate Information: NIF

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**Section 13 Disposal Considerations**
RCRA 40 CFR 261 Classification: OsO₄ is a listed EPA Hazardous Waste - P087.
Crystals and solutions may be dissolved and/or neutralized in an aqueous solution of sodium or potassium hydroxide (approx. 25%).
Consult Federal EPA, State and local regulations for proper disposal/recycle/reclamation. Chemical additions, processing or otherwise altering this material may make the waste management information presented above incomplete, inaccurate, or otherwise inappropriate.

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**Section 14: Transportation Information**
Note: Osmium Tetroxide is NOT classified as a poison inhalation hazard (PIH) by US DOT or IATA.

**US DOT Information:**
Proper shipping name: Toxic liquid, inorganic, n.o.s. (Osmium tetroxide 2% in aqueous solution).
Hazard Class: 6.1
Packaging group: III
UN Number: UN3287

**IATA:**
Proper shipping name: Toxic liquid, inorganic, n.o.s. (Osmium tetroxide 2% in aqueous solution).
Hazard Class: 6.1
Packaging group: III
UN Number: UN3287

**IMO:**
Proper shipping name: Toxic liquid, inorganic, n.o.s. (Osmium tetroxide 2% in aqueous solution).
Class: 6.1
UN Number: UN3287
Packaging group: III
Marine Pollutant: Severe marine pollutant. PP
Canadian TDG: Proper shipping name: Toxic liquid, inorganic, n.o.s. (Osmium tetroxide 2% in aqueous solution).

Section 15: Regulatory Information

United States Federal Regulations
SARA: Section 302: No
SARA Title III: Section 313: This product is subject to SARA Section 313 reporting requirements.
RCRA: Osmium Tetroxide/Osmium Oxide: RCRA Hazardous Waste: P-Series
TSCA: This chemical is TSCA listed, and is also classified with FDA as an IVD.
CERCLA: Osmium Tetroxide/Osmium Oxide (20816-12-0): RQ = 1000 lbs (454 kg).

State Regulations
California Proposition 65: No

International Regulations
Canada WHMIS: This product has been classified in accordance with the hazard criteria of CPR, and the MSDS contains all the information required by the CPR. DSL: Yes. NDSL: No.
Europe EINECS Numbers: Osmium Tetroxide/Osmium Oxide (20816-12-0): EINECS#: 244-058-7.

Section 16: Other Information

Label Information: Toxic

European symbols needed: T
Canadian WHMIS Symbols: ND
HMIS Hazard Rating: Health: 4; Fire: 0; Reactivity: 1
NFPA Hazard Rating: Health: 4; Fire: 0; Reactivity: 1 Other: TOX
(0=least, 1=Slight, 2=Moderate, 3=High, 4=Extreme)

Abbreviations used in this document
NE= Not established
NA= Not applicable
NIF= No Information Found
ND= No Data

Disclaimer
Ted Pella, Inc. makes no warranty of any kind regarding the information furnished herein. Users should independently determine the suitability and completeness of information from all sources. While this data is presented in good faith and believed to be accurate, it should be considered only as a supplement to other information gathered by the user. It is the User's responsibility to assure the proper use and disposal of these materials as well as the safety and health of all personnel who may work with or otherwise come in contact with these materials.

SDS Form 0013F1V4