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Manufacturer's CAGE: 1P573

Safety Data Sheet

Date Effective: November 19, 2019

02595-BA, 02597-BA
Aqueous Osmium Tetroxide, 2%

02598-BA, 02599-BA, 02600-BA
Aqueous Osmium Tetroxide, 4%

Section 1.1: Identification

Chemical Name/Synonyms ..... Osmium Tetroxide, Aqueous Solution; Osmic acid

Product or Trade Name ..... SPI-Chem™ Aqueous Osmium Tetroxide, 2% or 4%

CAS #'s 20816-12-0; 7732-18-5

Chemical Formula..... O_4Os in H_2O

Section 1.2: Relevant Uses/Restrictions

Laboratory chemical; Fixative for Transmission Electron Microscopy

Section 1.3: Supplier of the Safety Data Sheet

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Section 1.4: Emergency telephone number

Emergencies
Contacting CHEMTREC:

24 Hour Emergency Use Only #'s...
Worldwide phone: 1-(703)-741-5970
Toll-free phone: 1-(800)-424-9300 USA + Canada only

Section 2: Hazard Identification

2.1 Classification of the substance

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Oral (Category 3)
Acute toxicity, Inhalation (Category 2)
Acute toxicity, Dermal (Category 4)
Skin irritation (Category 2)

Serious eye damage (Category 1)
Respiratory sensitization (Category 1)

2.2 Label elements

Pictogram

Signal Word: Danger

Hazard statements:

H301 Toxic if swallowed.
H312 Harmful in contact with skin.
H315 Causes skin irritation.
H318 Causes serious eye damage.
H330 Fatal if inhaled.
H334 My cause allergy or asthma symptoms or breathing difficulties if inhaled.

Precautionary statements:

P260 Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
P262 Do not get in eyes, on skin, or on clothing.
P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
P284 Wear respiratory protection.
P301 + P310 + P330 IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
P312 Call a POISON CENTER or doctor if you feel unwell.
P304 + P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P332 + P313 If skin irritation occurs: Get medical advice / attention.
P362 Take off contaminate d clothing and wash before reuse.
P403 + P233 Sore in a well-ventilated place. Keep container tightly closed.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Other Hazards:

Hazardous Material Information System USA

Health 4
Fire Hazard 0
Reactivity 0
Personal Protection .....

NFPA Rating (estimated)

Health 4
Flammability..... 0
Reactivity 0

Section 3: Composition

3.2 Mixtures:

Chemical	CAS #	EC #	Percentage
Water	7732-18-5	231-791-2	96 – 98 %
Osmium tetroxide	20816-12-0	244-058-7	2 – 4 %

Section 4: First Aid Measures

4.1 Description of first aid measures:

General Information: Ensure proper ventilation.

Notable Exposure Routes: Irritation to skin, eyes, and areas of contact.

Inhalation: Remove the victim from the contaminated area while protecting yourself from exposure by wearing an appropriate respirator. Put a similar respirator on the victim if possible. Get immediate medical attention.

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

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses if present and easy to do. Get medical attention if irritation develops or persists.

Ingestion: Rinse mouth. SEEK IMMEDIATE MEDICAL ATTENTION. Clear the airway and administer artificial respiration if not breathing. If swallowed, do not induce vomiting unless directed to do so by medical personnel.

Additional Information: Observe for any symptoms for several hours after exposure. Follow up with medical attention if symptoms develop.

4.2 Most important symptoms and effects, both acute and delayed: Irritation to skin, eyes, and areas of contact.

4.3 Indication of any immediate medical attention and special treatment needed: Observe for any symptoms for several hours after exposure. Follow up with medical attention if symptoms develop.

Section 5: Fire Fighting Measures

General Information: Emits toxic fumes under fire conditions.

5.1 Extinguishing media: Water fog; Carbon dioxide; Dry chemical powder; “Alcohol” foam.

5.2 Special hazards arising from the substance or mixture: O_4Os is a strong oxidizer and may react explosively with many organic compounds. Emits toxic fumes under fire conditions.

5.3 Hazardous combustion products: Constituents associated with burning/ combustion are to be considered toxic.

5.4 Advice for firefighters: Firefighters should wear self-contained breathing apparatus and full protective gear.

5.5 Special protective equipment and precautions for firefighters: No additional information available.

Section 6: Accidental Release Measures

6.1 Personal precautions:

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

6.2 Environmental precautions: Do not allow chemical to enter the environment.

6.3 Methods and material for containment and cleaning up:

Large spills: Contain actively spilling material if safe and easy to do so, avoid generating dust.
Small spills: Sweep spilled substance into containers.
Collect all contaminated media, or other cleanup materials into a waste receptacle for disposal.
If cleaning surface is necessary, utilize vacuum cleaner, provided adequate ventilation is available.

6.4 Reference to other sections: See Section 8 for information on personal protection equipment. See Section 13 for information on disposal.

Section 7: Handling and Storage

7.1 Precautions for safe handling:

Do not handle until all safety precautions have been read and understood.

Protective measures:

Keep containers tightly closed.
Ensure adequate ventilation.
Avoid breathing dust or solution spray.
Avoid contact with eyes, skin, and clothing.
Avoid prolonged or repeated exposure.
Wear appropriate personal protective equipment.

Advice on general hygiene conditions:

Wash thoroughly after handling.
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. Keep container tightly closed when not in use.
Use only with adequate personal protection.

7.2 Conditions for safe storage, including any incompatibilities:

Store in cool, dry area in a tightly closed product container.
Store at 2 – 8 °C.
Store away from sources of ignition or flame.

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. LDLH 1 mg/m3

7.3 Specific end uses:

Identified Use: Laboratory chemical; Fixative for Transmission Electron Microscopy.

This material is not being offered for clinical or diagnostic applications, agricultural uses or for human or animal consumption.

Section 8: Exposure Controls and Personal Protection

8.1 Control parameter and Personal Protection:

Workplace exposure limits:

NIOSH REL:	TWA 0.002 mg/m^3 (0.0002 ppm)	STEL: 0.006 mg/m3 (0.0006 ppm)
OSHA PEL:	TWA: 0.002 mg/m3	
IDHL:	1 mg/m3 as (Os)	Conversion: 1 ppm = 10.40 mg/m^3

NIOSH: RTECS RN1140000

Biological limit values: No data available**.**

8.2 Exposure controls:

8.2.1 Appropriate engineering controls:

Ventilation: Local exhaust: yes; Mechanical exhaust: yes; Fume Hood: yes

8.2.2 Individual protection measures:

Work Clothing: Protective work clothing which covers skin and prevents exposures. Lab coat/ apron, flame and chemical resistant protective clothing, eye wash, safety shower, and hygiene facilities for washing.

Eye/face Protection: Wear safety glasses with side shields or goggles or face shield.

Skin Protection: Wear chemical resistant gloves.

Respiratory Protection: 0.1 mg/m3 supplied air respirator with a full face piece.

8.2.3 Environmental exposure controls:

Do not allow to enter the environment.

Section 9: Physical and Chemical Properties

9.1 Information on basic physical and chemical properties:

Appearance: Liquid, Colorless to pale yellow

Odor: Sharp chlorine like

Odor threshold: No data available

pH: 6-7

Melting point/Freezing point: 0 °C

Boiling point/Boiling point range: 100 °C

Flash Point: No data available

Evaporation rate: No data available

Flammability (solid, gas): No data available

Upper/lower flammability or explosive limits: No data available

Vapor Pressure: 63.591 mm Hg

Vapor density: No data available

Relative density: No data available

Solubility: 5g OsO_4 in 100 ml water

Partition coefficient (n-octanol/water): No data available

Auto-ignition temperature: No data available

Decomposition temperature: No data available

Viscosity: No data available

Explosive properties: No data available

Oxidizing Properties: No data available

9.2 Other information: No additional information available

Section 10: Stability and Reactivity

10.1 Reactivity: Non-reactive under normal conditions of use.

10.2 Chemical Stability: Stable under normal conditions of use.

10.3 Possibility of Hazardous Reactions: Product is not subject to hazardous polymerization.

10.4 Conditions to avoid:

Avoid open flame and ignition sources.
Avoid elevated temperature.
Contact with Hydrochloric Acid will cause formation of poisonous chlorine gas.

10.5 Incompatible materials:

Strong reducing agents; Organic materials; Hydrochloric acid; Bases; Chlorine gas/ Finely powdered metals.
Contact with HCl will form poisonous chlorine gas.

10.6 Hazardous decomposition products: The nature of decomposition products is not known.

Section 11: Toxicological Information

Information on the likely routes of exposure:

So far as we know, the chemical, physical and toxicological properties have not been thorough investigated. OsO_4 is highly destructive in an irreversible way to all tissue of the mucous membranes and upper respiratory tract, eyes and skin. Inhalation may result in spasm, convulsions, inflammation and edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema.

Symptoms of exposure:

Burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting. Symptoms might be delayed. A "halo" effects with vision would indicate a chronic low level exposure and one for which immediately steps should be taken to remove the exposure risk. Sometimes this halo effect is described as color rings around lights. Exposure to skin can cause a greenish or black discoloration of the skin where exposure occurred. May be fatal if inhaled, swallowed, or absorbed through the skin. Allergic like reactions are also possible.

Chronic effects:

Target organs: Eyes, central nervous system, male reproductive system, kidneys

A. Acute toxicity:

Oral/mouse LD50 162 mg/kg
Inhalation/man LDLo 133 µg/m3
Inhalation/mouse LCLo 40 ppm / 4h
Inhalation/rat LCLo 40 ppm / 4h
Intraperitoneal/mouse LD50 13500 µg/kg
Intraperitoneal/rat LD50 14100 µg/kg

B. Skin corrosion/irritation:

No data available.

C. Serious eye damage/irritation:

Ocular/rabbit TDLo 0.25 mg/kg

D. Respiratory or skin sensitization:

Product is not expected to be a sensitizer.

E. Germ cell mutagenicity:

Chronic: Embryo/Hamster 200 umol/l Unscheduled DNA synthesis /Bacillus subtilis 5 µmol/l DNA repair

F. Carcinogenicity:

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible, or confirmed human carcinogen by IARC.

OSHA: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP>

ACGIH: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

G. Reproductive toxicity:

Intratesticular/rat 20336 µg/kg (1 D male) Patermal effects: Spermatogenesis (including genetic material, sperm morphology, motility, and count)

Intratesticular/rat	20336 µg/kg (1D male) Paternal effects: Testes, epididymis, Sperm duct
Subcutaneous/mouse	20336 µg/kg (30 D male) Paternal effects: Spermatogenesis (including genetic material, sperm morphology, motility, and count)
Subcutaneous/mouse	20336 µg/kg (30 D male) Paternal effects: Testes epididymis, sperm duct

H. STOT-single exposure:
No additional information available.

I. STOT-repeated exposure:
No additional information available.

J. Aspiration hazard:
No data available.

Section 12: Ecological Information

12.1 Toxicity:
Aquatic toxicity: No specific data available.
Do not allow large quantities of product to reach water, ground water, water courses, or sewer systems.

12.2 Persistence and degradability: No specific data available.

12.3 Bio-accumulative potential: No specific data available.

12.4 Mobility in soil: No specific data available.

12.5 Results of PBT and vPvB assessment: PBT/vPvB assessment not available as chemical safety assessment not required/ not conducted.

12.6 Other adverse effects: No additional data available.

Section 13: Disposal Considerations

13.1 Waste treatment methods:

Product disposal: Consult Federal EPA, State and local regulations for proper disposal/ recycle/ reclamation.

Container disposal: Treat empty containers with extra care. Consult waste contractor.

Other considerations: NOTE; Chemical additions, processing, or otherwise altering this material may make the waste management information presented above incomplete, inaccurate, or otherwise inappropriate.

Section 14: Transport Information

DOT:
UN Number: UN 3287
Proper shipping name: Toxic liquid, inorganic, N.O.S. (Osmic acid)
Class: 6.1
Packing group: II
Reportable Quantity (RQ)

Poison Inhalation Hazard: No

IMDG:

UN Number: UN 3287
Proper shipping name: TOXIC LIQUID, INORGANIC, N.O.S. (OSMIC ACID)
Class: 6.1
Packing group: II
EMS-No: F-A, S-A

IATA:

UN Number: UN 3287
Proper shipping name: Toxic liquid, inorganic, N.O.S. (Osmic acid)
Class: 6.1
Packing group: II

Section 15: Regulatory Information

15.1 Safety, health and environmental regulations/ legislation specific for the substance or mixture:

U.S. Government Regulations:

TSCA: All ingredients of this product are listed or are excluded from listing under the U.S. Toxic Substances Control Act. (TSCA) Chemical Substance Inventory..

SARA 313: This product is subject to SARA Section 313 reporting requirements.
Ingredient(s) – U.S. Regulatory Information: Osmium Tetroxide / Osmium Oxide.
RCRA Hazardous Waste
Acute Health Hazard
Chronic Health Hazard
Toxic Release Chemical List – 1.0 De Minimis for OsO4

SARA Section 304 Reportable Quantity: 1000 lbs for OsO4.

State Regulations:

Massachusetts Right To Know Components: Osmic Acid CAS # 20816-12-0
Pennsylvania Right To Know Components: Osmic Acid CAS # 20816-12-0
New Jersey Right To Know Components: Osmic Acid CAS # 20816-12-0

California Prop. 65 Components:

This product does not contain any chemicals known to the State of California to cause cancer, birth defects, or any other reproductive harm.

CANADA: This product has been classified in accordance with the hazard criteria of the CPR, and the SDS contains all the information required by the CPR.

DSL: CAS # 20816-12-0 is listed on the DSL list.
NDSL: CAS # 20816-12-0 is not listed on the NDSL list.

15.2 Chemical Safety Assessment: A chemical safety assessment has not been carried.

Date of Preparation: 19 November 2019

Abbreviations and acronyms

IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
CMRG: Chemical Manufacturer's Recommended Guidelines
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists

AIHA: American Industrial Hygiene Association
EINECS: European Inventory of Existing Commercial Chemical Substances
ELINCS: European List of Notified Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bio-accumulative and Toxicological
vPvB: very Persistent and very Bio-accumulative
NIOSH: National Institute for Occupational Safety
OSHA: Occupational Safety Health
ATE: Acute Toxicity Estimates
TLV: Threshold Limit Value
PEL: Permissible Exposure Limit
REL: Recommended Exposure Limit
STEL: Short Term Exposure Limit
CEIL: Ceiling
TSCA: Toxic Substances Control Act (USA)
DSL: Domestic Substances List (Canada)
PICCS: Philippine Inventory of Chemicals and Chemical Substances
ENCS: Existing and New Chemical Substances (Japan)
AICS: Australian Inventory of Chemical Substances
IECSC: Inventory of Existing Chemical Substances in China
KECL: Korea Existing Chemicals List

Section 16: Other Information

Disclaimer of Liability:

Caution! Do not use SPI Supplies products or materials in applications involving implantation within the body; direct or indirect contact with the blood pathway; contact with bone, tissue, tissue fluid, or blood; or prolonged contact with mucous membranes. Products offered by SPI Supplies are not designed or manufactured for use in implantation in the human body or in contact with internal body fluids or tissues. SPI Supplies will not provide to customers making devices for such applications any notice, certification, or information necessary for such medical device use required by US FDA (Food and Drug Administration) regulation or any other statute. SPI Supplies and Structure Probe, Inc. make no representation, promise, express warranty or implied warranty concerning the suitability of these materials for use in implantation in the human body or in contact with internal body tissues of fluids.

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