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Structure Probe, Inc.
206 Garfield Ave., West Chester, PA 19380-4512 USA
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Manufacturer's CAGE: 1P573

Safety Data Sheet

Date Effective: November 6, 2019

SPI Catalog #'s 02590-AB, 02601-AB, 02602-AB, 02604-AB
SPI-Chem™ Osmium Tetroxide

Section 1.1: Identification

Chemical Name/Synonyms ..... Osmium Tetroxide; Osmium (VIII) oxide; Osmic acid; Osmic anhydride

Product or Trade Name ..... SPI-Chem™ Osmium Tetroxide

CAS #'s 20816-12-0

Chemical Formula..... OsO_4

Chemical Family: Platinum Group Metal Salts

Section 1.2: Relevant Uses/Restrictions

Identified Use: 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 1 / 2
Acute toxicity, dermal	Category 1 / 2
Acute toxicity, inhalation	Category 1 / 2

Skin corrosion / irritation	Category 1
Serious eye damage / eye irritation	Category 1
Specific target organ tox. single exp.	Category 1

2.2 Label elements

Pictogram

Signal Word: Danger

Hazard statements:

H300 + H330 Fatal if swallowed or if inhaled.
H311 Toxic in contact with skin
H314 Causes severe skin burns and eye damage.
H318 Causes serious eye damage.
H370 Causes damage to organs

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
P260 Do not breathe dust/ fume/ gas/ mist/ vapors/ spray
P264 Wash thoroughly after handling
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection
P284 Wear respiratory protection
P302 + P352 IF ON SKIN: Wash with soap and water
P305 + P351 + 338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P310 Immediately call a POISON CENTER or doctor/physician

2.3 Other Hazards:

THE SUBSTANCE CAN BE ABSORBED INTO THE BODY BY INHALATION OF ITS VAPORS, BY INHALATION OF ITS AEROSOL, AND BY INGESTION. A HARMFUL CONTAMINATION OF AIR CAN BE REACHED VERY QUICKLY ON EVAPORATION OF THIS SUBSTANCE AT 20 °C. CONTACT WITH COMBUSTIBLE MATERIAL MAY CAUSE FIRE.

OSHA Hazards

Oxidizing, Target Organ Effect, Highly toxic by inhalation, Highly toxic by ingestion, Highly toxic by skin absorption, Respiratory sensitizer, Corrosive

Target Organs

Eyes, Central nervous system, Male reproductive system, Kidney

Other hazards which do not result in classification

Lachrimator

Primary Routes of Entry:

Eye: Likely

Inhalation: Likely
Skin: Likely
Ingestion: Likely

Eye Hazards:
REDNESS, PAIN, BLURRED VISION, LOSS OFVISION, SEVERE DEEP BURNS

Skin Hazards:
Possible skin discoloration (green or black), Redness, Skin burns, Pain, Blisters.
VERY TOXIC IN CONTACT WITH THE SKIN.

Ingestion Hazards:
Abdominal cramps, Burning sensation, Shock or Collapse.
VERY TOXIC IF SWALLOWED.

Inhalation Hazards:
Burning sensation, Cough, Headache, Wheezing, Shortness of Breath, Visual disturbances.
SYMPTOMS MAY BE DELAYED.
VERY TOXIC IF INHALED.

Subchronic (Target Organ Effects):
Eyes, Skin, Respiratory System, Central Nervous System

Conditions Aggravated by Exposure:
AVOID ALL CONTACT WITH THIS CHEMICAL.

Hazardous Material Information System USA
Health 4
Fire Hazard 0
Reactivity 1
Personal Protection ..... J

NFPA Rating (estimated)
Health 4
Flammability..... 0
Reactivity 1
Other..... TOX

Section 3: Composition

3.1 Substances:

Osmium tetroxide CAS # 20816-12-0 EC # 244-058-7 Weight Percent: 99.9

RCRA Number: P087

Section 4: First Aid Measures

4.1 Description of first aid measures:

General Information: Ensure proper ventilation.

Notable Exposure Symptoms: 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. CONTACT A PHYSICIAN IMMEDIATELY.

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses if present and easy to do. CONTACT A PHYSICIAN IMMEDIATELY.

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. CONTACT A PJYSICIAN IMMEDIATELY.

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: O_4Os is a strong oxidizer and may react explosively with many organic compounds. Risk of fire and explosion when mixed with combustible substances. No contact with flammable substances. Not combustible, but enhances combustion of other substances. Emits toxic fumes under fire conditions.

5.1 Extinguishing media: Carbon dioxide; dry chemical powder; appropriate 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. Risk of fire and explosion when mixed with combustible substances. No contact with flammable substances. Not combustible, but enhances combustion of other substances. 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.

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

Section 6: Accidental Release Measures

6.1 Personal precautions:

EVACUATE AREA IMMEDIATELY!
CONSULT AN EXPERT (Onsite HazMat Team or 911).
WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS, AND HEAVY RUBBER GLOVES. FULL PROTECTIVE EQUIPMENT WITH SELF-CONTAINED BREATHING APPARATUS IS A MUST.
WEAR DISPOSABLE COVERALLS AND DISCARD THEM AFTER USE.
SWEEP SPILLED SUBSTANCE INTO CONTAINERS.
IF APPROPRIATE, MOISTEN FIRST TO PREVENT DUSTING, THEN REMOVE TO SAFE PLACE.
DO NOT ABSORB IN SAWDUST OR OTHER COMBUSTIBLE MATERIAL.

DO NOT LET THIS CHEMICAL ENTER THE ENVIRONMENT.

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. Collect material and dispose.

Small spills: Sweep spilled substance into containers.

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.

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 exposure to vapor.
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.
Use with local exhaust ventilation.
Use only in closed systems.
Use NIOSH approved respiratory protection.

7.2 Conditions for safe storage, including any incompatibilities:

Store in cool, dry area in a tightly closed product container.
Do not store directly on ground.
Do not store near combustible materials.
Keep container upright.
Store away from sources of ignition or flame.

Other precautions: 0.1 mg/m^3 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/m^3 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/m^3

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)	ST 0.006 mg/m^3 (0.0006 ppm)
OSHA PEL:	TWA 0.002 mg/m^3	
IDLH:	1 mg/m^3 as (Os)	
	Conversion: 1ppm = 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: NIOSH approved chemical cartridge respirator for acid gas and dust/ mist/ fume or self-contained breathing apparatus with full face shield.

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:

State: Crystalline

Color: Colorless to pale yellow

Odor: Sharp chlorine like

Odor threshold: No data available

pH: 6-7

Melting point: 103.1-106 ° F (39.5-41.0 **°** C) (lit.)

Boiling point/Boiling point range: 266.0 °F (130 °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: 9 hPa (7 mm Hg) at 20 **°**C (68 °F)

69 hPa (52 mmHg) at 55 **°**C (131 °F)

Vapor density: No data available

Relative density: 4.9

Solubility in water: 6% @ 77 ° **F**

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

Molecular Wt.: 254.2

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:

Begins to sublime below boiling point and releases a poisonous and irritating vapor.
Contact with other materials may cause fire.

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. The material 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

11.1 Information on toxicological effects:

A. Acute toxicity:

Oral/mouse	LD50	162 mg/kg
Inhalation/man	LDLo	133 µg/m^3
Inhalation/mouse	LC_{LO}	40 ppm / 4h
Inhalation/rat	LC_{LO}	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	TD_{LO}	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 systhesis
/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) 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) 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:

THIS SUBSTANCE MAY BE HAZARDOUS TO THE ENVIRONMENT; SPECIAL ATTENTION SHOULD BE GIVEN TO CRUSTACEA.

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 2471
Proper shipping name:	Osmium tetroxide
Class:	6.1

Packing group:	I
Reportable Quantity (RQ)	1000 lbs.
Poison Inhalation Hazard:	No

IMDG:

UN Number:	UN 2471
Proper shipping name:	OSMIUM TETROXIDE
Class:	6.1
Packing group:	I
EMS-No:	F-A, S-A
Marine pollutant:	yes

IATA:

UN Number:	UN 2471
Proper shipping name:	Osmium tetroxide
Class:	6.1
Packing group:	I

Section 15: Regulatory Information

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

U.S. Government Regulations:

TSCA: This chemical is listed on the TSCA Active Inventory List.

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

SARA Section 304 Reportable Quantity: 1000 lbs.

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.

European Union (EU):

Regulatory Information:
Indication of Danger: T+
Symbol of Danger: very Toxic
Risk #: 26/27/28-34:

Very toxic by inhalation, in contact with skin, and if swallowed.
Causes burns.

Safety #: 7/9-26-45:

Keep container tightly closed and in well-ventilated place.
In case of contact with eyes, rinse immediately with water and seek medical advice.
In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

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

Date of Preparation: 09 January 2019.
Revision 1: 06 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

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