

Osmium, Powder

sc-358480



The Power is Question

Material Safety Data Sheet

Hazard Alert Code Key: **EXTREME** **HIGH** **MODERATE** **LOW**

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

Osmium, Powder

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

Santa Cruz Biotechnology, Inc.
2145 Delaware Avenue
Santa Cruz, California 95060
800.457.3801 or 831.457.3800

EMERGENCY:

ChemWatch

Within the US & Canada: 877-715-9305

Outside the US & Canada: +800 2436 2255

(1-800-CHEMCALL) or call +613 9573 3112

PRODUCT USE

One of the platinum group of metals. Found in minerals osmiridium, and in platinum ores. Used as a catalyst in the synthesis of ammonia and in hydrogenations of organic compounds; as an alloy with iridium for fine machine bearings and pen points.

SYNONYMS

Os

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

Min/Nil=0
Low=1
Moderate=2
High=3
Extreme=4



CANADIAN WHMIS SYMBOLS



EMERGENCY OVERVIEW

RISK

Risk of serious damage to eyes.
Irritating to respiratory system and skin.
Highly flammable.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

- Not normally a hazard due to physical form of product.
- Considered an unlikely route of entry in commercial/industrial environments.

EYE

- If applied to the eyes, this material causes severe eye damage.
 - Contact with the eye, by metal dusts, may produce mechanical abrasion or foreign body penetration of the eyeball.
 - Brief exposures to osmium tetroxide vapour produces delayed lachrymation, "halo" effects (appearance of rings around lights) and vision disturbances (gritty feeling in the eyes).
- These symptoms usually cease a few days after exposure.

SKIN

- This material can cause inflammation of the skin on contact in some persons.
- The material may accentuate any pre-existing dermatitis condition.
- Skin contact is not thought to have harmful health effects, however the material may still produce health damage following entry through wounds, lesions or abrasions.
- Skin contact with low concentrations of osmium tetroxide vapor can cause irritation, while contact with high concentrations of vapor or with the solid form can cause severe inflammation, burns, and green or black discoloration. Kidney or liver damage may also result.
- Open cuts, abraded or irritated skin should not be exposed to this material.
- Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED

- The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage.
- Inhalation of dusts, generated by the material during the course of normal handling, may be damaging to the health of the individual.
- Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.
- The inhalation of small particles of metal oxide results in sudden thirst, a sweet, metallic or foul taste, throat irritation, cough, dry mucous membranes, tiredness and general unwellness. Headache, nausea and vomiting, fever or chills, restlessness, sweating, diarrhea, excessive urination and prostration may also occur.
- Inhalation of osmium tetroxide vapor may irritate the nose, throat, and bronchial tubes, causing a cough, wheezing, pneumonia, and headache. The vapour produces acute tracheobronchitis characterised by cough, sore throat, chest pain and lightheadedness. The lungs and respiratory tract retain most of the inhaled osmium tetroxide vapors causing irritation and black discoloration. Lung, liver, or kidney damage could result from inhalation exposure.

CHRONIC HEALTH EFFECTS

- Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems. Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems. Metallic dusts generated by the industrial process give rise to a number of potential health problems. The larger particles, above 5 micron, are nose and throat irritants. Chronic exposure to trace amounts of osmium tetroxide may result in kidney and liver damage. Currently, there is no evidence that osmium tetroxide is carcinogenic. However, it has been shown to induce DNA lesions and DNA-repair replication in mammalian cells. Osmium tetroxide has shown reproductive toxicity in animals; however, it has not shown reproductive or developmental effects in humans.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
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fine powders slowly oxidise to give

[osmium tetroxide](#)

20816-12-0

Section 4 - FIRST AID MEASURES

SWALLOWED

· Immediately give a glass of water. · First aid is not generally required. If in doubt, contact a Poisons Information Center or a doctor.

EYE

■ If this product comes in contact with the eyes: · Immediately hold eyelids apart and flush the eye continuously with running water. · Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. · DO NOT attempt to remove particles attached to or embedded in eye. · Lay victim down, on stretcher if available and pad BOTH eyes, make sure dressing does not press on the injured eye by placing thick pads under dressing, above and below the eye. · Seek urgent medical assistance, or transport to hospital.

SKIN

■ If skin contact occurs: · Immediately remove all contaminated clothing, including footwear · Flush skin and hair with running water (and soap if available).

INHALED

· If fumes or combustion products are inhaled remove from contaminated area. · Lay patient down. Keep warm and rested.

NOTES TO PHYSICIAN

■ Treat symptomatically.

Copper, magnesium, aluminum, antimony, iron, manganese, nickel, zinc (and their compounds) in welding, galvanizing or smelting operations all give rise to thermally produced particulates of smaller dimension than might be produced if the metals are divided mechanically. Where insufficient ventilation or respiratory protection is available these particulates may produce "metal fume fever" in workers from an acute or long term exposure.

Section 5 - FIRE FIGHTING MEASURES

Vapour Pressure (mmHG):	Negligible
Upper Explosive Limit (%):	Not applicable
Specific Gravity (water=1):	22.61
Lower Explosive Limit (%):	Not applicable

EXTINGUISHING MEDIA

■ Metal dust fires need to be smothered with sand, inert dry powders.

DO NOT USE WATER, CO₂ or FOAM.

· DO NOT use halogenated fire extinguishing agents.

FIRE FIGHTING

· Alert Emergency Responders and tell them location and nature of hazard.

· Wear breathing apparatus plus protective gloves.

When any large container (including road and rail tankers) is involved in a fire, consider evacuation by 800 metres in all directions.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

■ Decomposition may produce toxic fumes of: metal oxides.

· DO NOT disturb burning dust. Explosion may result if dust is stirred into a cloud, by providing oxygen to a large surface of hot metal.

· DO NOT use water or foam as generation of explosive hydrogen may result.

With the exception of the metals that burn in contact with air or water (for example, sodium), masses of combustible metals do not represent unusual fire risks because they have the ability to conduct heat away from hot spots so efficiently that the heat of combustion cannot be maintained - this means that it will require a lot of heat to ignite a mass of combustible metal. Generally, metal fire risks exist when sawdust, machine shavings and other metal 'fines' are present.

Metal powders, while generally regarded as non-combustible:

· May burn when metal is finely divided and energy input is high.

· May react explosively with water.

· May be ignited by friction, heat, sparks or flame.

· May REIGNITE after fire is extinguished.

· Will burn with intense heat.

Note:

· Metal dust fires are slow moving but intense and difficult to extinguish.

· Containers may explode on heating.

· Dusts or fumes may form explosive mixtures with air.

· Gases generated in fire may be poisonous, corrosive or irritating.

· Hot or burning metals may react violently upon contact with other materials, such as oxidising agents and extinguishing agents used on

fires involving ordinary combustibles or flammable liquids.

- Temperatures produced by burning metals can be higher than temperatures generated by burning flammable liquids
- Some metals can continue to burn in carbon dioxide, nitrogen, water, or steam atmospheres in which ordinary combustibles or flammable liquids would be incapable of burning.

FIRE INCOMPATIBILITY

- Reacts with acids producing flammable / explosive hydrogen (H2) gas.
 - Keep dry.
 - NOTE: May develop pressure in containers; open carefully. Vent periodically.
- None known.

PERSONAL PROTECTION

- Glasses:
Chemical goggles.
- Gloves:
- Respirator:
Particulate

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Remove all ignition sources.
- DO NOT touch or walk through spilled material.

MAJOR SPILLS

- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of overexposure occurs.

RECOMMENDED STORAGE METHODS

· CARE: Packing of high density product in light weight metal or plastic packages may result in container collapse with product release. Heavy gauge metal packages / Heavy gauge metal drums.

For low viscosity materials and solids: Drums and jerricans must be of the non-removable head type. Where a can is to be used as an inner package, the can must have a screwed enclosure.

STORAGE REQUIREMENTS

■ FOR MINOR QUANTITIES:

- Store in an indoor fireproof cabinet or in a room of noncombustible construction
- Provide adequate portable fire-extinguishers in or near the storage area.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m ³	STEL ppm	STEL mg/m ³	Peak ppm	Peak mg/m ³	TWA F/CC	Notes
Canada - Ontario Occupational Exposure Limits	osmium (Metal / Métal)		2						
Canada - Ontario Occupational Exposure Limits	osmium (Metal / Métal)		1						
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	osmium (Particulates Not Otherwise Classified (PNOC))		10						

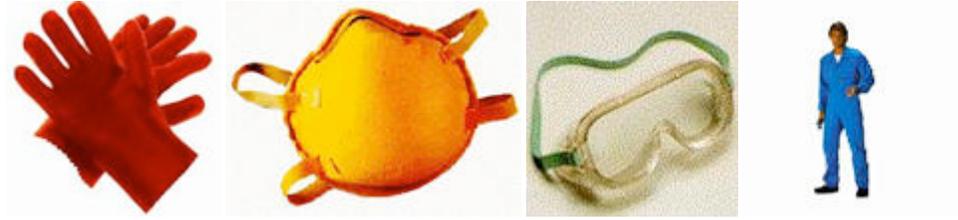
US ACGIH Threshold Limit Values (TLV)	osmium (Particles (Insoluble or Poorly Soluble) [NOS] Inhalable particles)		10				See Appendix B current TLV/BEI Book
US ACGIH Threshold Limit Values (TLV)	osmium (Particles (Insoluble or Poorly Soluble) [NOS] Respirable particles)		3				See Appendix B current TLV/BEI Book
Canada - Nova Scotia Occupational Exposure Limits	osmium (Particles (Insoluble or Poorly Soluble) [NOS] Respirable particles)		3				See Appendix B current TLV/BEI Book
US - Washington Permissible exposure limits of air contaminants	osmium (Particulates not otherwise regulated - Total particulate)		10		20		
US - Washington Permissible exposure limits of air contaminants	osmium (Particulates not otherwise regulated - Respirable fraction)		5		10		
Canada - Nova Scotia Occupational Exposure Limits	osmium (Particles (Insoluble or Poorly Soluble) [NOS] Inhalable particles)		10				See Appendix B current TLV/BEI Book
Canada - Alberta Occupational Exposure Limits	osmium tetroxide (Osmium tetroxide, as Os)	0.0002	0.002	0.0006	0.006		
Canada - British Columbia Occupational Exposure Limits	osmium tetroxide (Osmium tetroxide)	0.0002		0.0006			
US NIOSH Recommended Exposure Limits (RELs)	osmium tetroxide (Osmium tetroxide)	0.0002	0.002	0.0006	0.006		
US OSHA Permissible Exposure Levels (PELs) - Table Z1	osmium tetroxide (Osmium tetroxide (as Os))		0.002				
US ACGIH Threshold Limit Values (TLV)	osmium tetroxide (Osmium tetroxide)	0.0002		0.0006			TLV Basis: eye, upper respiratory tract & skin irritation
US - Minnesota Permissible Exposure Limits (PELs)	osmium tetroxide (Osmium tetroxide (as Os))	0.0002	0.002	0.0006	0.006		

US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	osmium tetroxide (Osmium tetroxide (as Os))		0.002			
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	osmium tetroxide (Osmium tetroxide (as Os))	0.0002	0.002	0.0006	0.006	
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	osmium tetroxide (Osmium tetroxide (as Os))	0.0002	0.002	0.0006	0.006	
US - California Permissible Exposure Limits for Chemical Contaminants	osmium tetroxide (Osmium tetroxide, as Os)	0.0002	0.002	0.0006	0.006	
US - Idaho - Limits for Air Contaminants	osmium tetroxide (Osmium tetroxide (as Os))		0.002			
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	osmium tetroxide (Osmium tetroxide (as Os))	0.0002	0.0016	0.0006	0.0047	
US - Hawaii Air Contaminant Limits	osmium tetroxide (Osmium tetroxide (as Os))	0.0002	0.002	0.0006	0.006	
US - Alaska Limits for Air Contaminants	osmium tetroxide (Osmium tetroxide (as Os))	0.0002	0.002	0.0006	0.006	
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	osmium tetroxide (Osmium tetroxide, (as Os))	0.0002		0.0006		
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	osmium tetroxide (Osmium tetraoxide (as Os))	0.0002	0.002	0.0006	0.006	
US - Washington Permissible exposure limits of air contaminants	osmium tetroxide (Osmium tetroxide (as Os))	0.0002		0.0006		

US - Michigan Exposure Limits for Air Contaminants	osmium tetroxide (Osmium tetroxide (as Os))		0.002		0.006	
Canada - Prince Edward Island Occupational Exposure Limits	osmium tetroxide (Osmium tetroxide)	0.0002		0.0006		TLV Basis: eye, upper respiratory tract & skin irritation
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	osmium tetroxide (Osmium tetroxide (as Os))		0.002			
Canada - Nova Scotia Occupational Exposure Limits	osmium tetroxide (Osmium tetroxide)	0.0002		0.0006		TLV Basis: eye, upper respiratory tract & skin irritation
US - Oregon Permissible Exposure Limits (Z-1)	osmium tetroxide (Osmium tetroxide (as Os))		0.002			
Canada - Northwest Territories Occupational Exposure Limits (English)	osmium tetroxide (Osmium tetroxide (as Os))	0.0002	0.0021	0.0006	0.0063	

ENDOELTABLE

PERSONAL PROTECTION



RESPIRATOR

- particulate. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

EYE

- Safety glasses with side shields.
- Chemical goggles.

HANDS/FEET

- Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:
 - frequency and duration of contact,
 - chemical resistance of glove material,
 - glove thickness and
 - dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

- Protective gloves eg. Leather gloves or gloves with Leather facing.

Wear physical protective gloves, eg. leather.

OTHER

- Overalls.

- Eyewash unit.
- Some plastic personal protective equipment (PPE) (e.g. gloves, aprons, overshoes) are not recommended as they may produce static electricity.
- For large scale or continuous use wear tight-weave non-static clothing (no metallic fasteners, cuffs or pockets), non sparking safety footwear.

ENGINEERING CONTROLS

■ For large scale or continuous use:

- Spark-free, earthed ventilation system, venting directly to the outside and separate from usual ventilation systems
- Provide dust collectors with explosion vents.

Metal dusts must be collected at the source of generation as they are potentially explosive.

- Vacuum cleaners, of flame-proof design, should be used to minimize dust accumulation.
- Metal spraying and blasting should, where possible, be conducted in separate rooms. This minimizes the risk of supplying oxygen, in the form of metal oxides, to potentially reactive finely divided metals such as aluminum, zinc, magnesium or titanium.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Solid.

Does not mix with water.

Sinks in water.

State	Divided solid	Molecular Weight	190.20
Melting Range (°F)	4892~	Viscosity	Not Applicable
Boiling Range (°F)	9932~	Solubility in water (g/L)	Immiscible
Flash Point (°F)	Not applicable	pH (1% solution)	Not applicable
Decomposition Temp (°F)	Not Applicable	pH (as supplied)	Not applicable
Autoignition Temp (°F)	Not applicable	Vapour Pressure (mmHG)	Negligible
Upper Explosive Limit (%)	Not applicable	Specific Gravity (water=1)	22.61
Lower Explosive Limit (%)	Not applicable	Relative Vapor Density (air=1)	Not applicable
Volatile Component (%vol)	Negligible	Evaporation Rate	Not applicable

APPEARANCE

Blue-white lustrous metal; does not mix with water. Stable in cold air. The finely divided powder is slowly oxidised to form the toxic tetraoxide. Osmium appears in the third triad of the platinum group in the Periodic Table.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable.

STORAGE INCOMPATIBILITY

■ Osmium tetroxide:

- in contact with hydrochloric acid produces chlorine gas
- reacts explosively with 1-methylimidazole
- reacts violently with hydrogen peroxide
- may cause fire, explosions in contact with organic and combustible materials.
- WARNING: Avoid or control reaction with peroxides. All transition metal peroxides should be considered as potentially explosive. For example transition metal complexes of alkyl hydroperoxides may decompose explosively.
- The pi-complexes formed between chromium(0), vanadium(0) and other transition metals (haloarene-metal complexes) and mono- or poly-fluorobenzene show extreme sensitivity to heat and are explosive.
- Avoid reaction with borohydrides or cyanoborohydrides.
- Metals and their oxides or salts may react violently with chlorine trifluoride and bromine trifluoride.
- These trifluorides are hypergolic oxidisers. They ignite on contact (without external source of heat or ignition) with recognised fuels - contact with these materials, following an ambient or slightly elevated temperature, is often violent and may produce ignition.
- The state of subdivision may affect the results.
- Many metals may incandesce, react violently, ignite or react explosively upon addition of concentrated nitric acid.
- Some metals can react exothermically with oxidizing acids to form noxious gases.
- Very reactive metals have been known to react with halogenated hydrocarbons, sometimes forming explosive compounds (for example, copper dissolves when heated in carbon tetrachloride).
- Many metals in elemental form react exothermically with compounds having active hydrogen atoms (such as acids and water) to form flammable hydrogen gas and caustic products.
- Elemental metals may react with azo/diazo compounds to form explosive products.

- Some elemental metals form explosive products with halogenated hydrocarbons.
 - Reacts with acids producing flammable / explosive hydrogen (H2) gas.
 - Finely divided metal powders develop pyrophoricity when a critical specific surface area is exceeded; this is ascribed to high heat of oxide formation on exposure to air.
 - Safe handling is possible in relatively low concentrations of oxygen in an inert gas
 - Several pyrophoric metals, stored in glass bottles have ignited when the container is broken on impact. Storage of these materials moist and in metal containers is recommended.
 - The reaction residues from various metal syntheses (involving vacuum evaporation and co-deposition with a ligand) are often pyrophoric.
 - Keep dry.
 - Reacts slowly with water.
 - CAUTION contamination with moisture will liberate explosive hydrogen gas, causing pressure build up in sealed containers.
 - Reacts violently with caustic soda, other alkalis - generating heat, highly flammable hydrogen gas.
 - If alkali is dry, heat generated may ignite hydrogen - if alkali is in solution may cause violent foaming.
- Avoid halogens and phosphorus.
 Attacked by aqua regia and oxidising agents over time and by molten alkali hydrosulfates, potassium hydroxide.
- For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

osmium

TOXICITY AND IRRITATION

- unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.
- Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

OSMIUM:

- No significant acute toxicological data identified in literature search.

Convulsions, dyspnea, nausea and vomiting recorded.

OSMIUM TETROXIDE:

TOXICITY	IRRITATION
Inhalation (man) TCLo: 0.133 mg/m ³	Nil Reported
Inhalation (rat) LCLo: 40 ppm/4h **[CCINFO - Manufacturer]	
Inhalation (rabbit) LCLo: 1316 mg/m ³ /30m	
Oral (mouse) LD50: 162 mg/kg	
Oral (rat) LD50: 14 mg/kg**	
Hamster cell mutagen	
Reproductive effector in rats	

CARCINOGEN

METALS	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	P65-MC
osmium tetroxide	US - Rhode Island Hazardous Substance List	IARC	

Section 12 - ECOLOGICAL INFORMATION

This material and its container must be disposed of as hazardous waste.

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
osmium	No Data Available	No Data Available		

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions

A. General Product Information

Ignitability characteristic: use EPA hazardous waste number D001 (waste code I)

B. Component Waste Numbers

When osmium tetroxide is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number P087 (waste code T).

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.

‡ Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility can be identified.

Section 14 - TRANSPORTATION INFORMATION

DOT:

Symbols: None Hazard class or Division: 4.1

Identification Numbers: UN3089 PG: II

Label Codes: 4.1 Special provisions: IB8, IP2,

IP4, T3,

TP33

Packaging: Exceptions: 151 Packaging: Non- bulk: 212

Packaging: Exceptions: 151 Quantity limitations: 15 kg

Passenger aircraft/rail:

Quantity Limitations: Cargo 50 kg Vessel stowage: Location: B

aircraft only:

Vessel stowage: Other: None

Hazardous materials descriptions and proper shipping names:

Metal powders, flammable, n.o.s.

Air Transport IATA:

UN/ID Number: 3089 Packing Group: II

Special provisions: A3

Cargo Only

Packing Instructions: 50 kg Maximum Qty/Pack: 448

Passenger and Cargo Passenger and Cargo

Packing Instructions: 15 kg Maximum Qty/Pack: 445

Passenger and Cargo Limited Quantity Passenger and Cargo Limited Quantity

Packing Instructions: 5 kg Maximum Qty/Pack: Y441

Shipping Name: METAL POWDER, FLAMMABLE, N.O.S.(CONTAINS

OSMIUM)

Maritime Transport IMDG:

IMDG Class: 4.1 IMDG Subrisk: None

UN Number: 3089 Packing Group: II

EMS Number: F-G,S-G Special provisions: None

Limited Quantities: 1 kg

Shipping Name: METAL POWDER, FLAMMABLE, N.O.S.(contains osmium)

Section 15 - REGULATORY INFORMATION

osmium tetroxide (CAS: 20816-12-0) is found on the following regulatory lists;

"Canada - Alberta Occupational Exposure Limits", "Canada - British Columbia Occupational Exposure Limits", "Canada - Northwest Territories Occupational Exposure Limits (English)", "Canada - Nova Scotia Occupational Exposure Limits", "Canada - Prince Edward Island Occupational Exposure Limits", "Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)", "Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits", "Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances", "Canada Domestic Substances List (DSL)", "Canada Ingredient Disclosure List (SOR/88-64)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "US - Alaska Limits for Air Contaminants", "US - California Air Toxics ""Hot Spots"" List (Assembly Bill 2588) Substances for which production, use or other presence must be reported", "US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List", "US - California Permissible Exposure Limits for Chemical Contaminants", "US - Connecticut Hazardous Air Pollutants", "US - Hawaii Air Contaminant Limits", "US - Idaho - Limits for Air Contaminants", "US - Massachusetts Oil & Hazardous Material List", "US - Michigan Exposure Limits for Air Contaminants", "US - Minnesota Hazardous Substance List", "US - Minnesota Permissible Exposure Limits (PELs)", "US - New Jersey Right to Know Hazardous Substances", "US - Oregon Hazardous Materials", "US - Oregon Permissible Exposure Limits (Z-1)", "US - Pennsylvania - Hazardous Substance List", "US - Rhode Island Hazardous Substance List", "US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants", "US - Vermont Hazardous Constituents", "US - Vermont Hazardous Waste - Acutely Hazardous Wastes", "US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants", "US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants", "US - Washington Dangerous waste constituents list", "US - Washington Discarded Chemical Products List - ""P"" Chemical Products", "US - Washington Permissible exposure limits of air contaminants", "US - Wyoming List of Highly Hazardous Chemicals, Toxics and Reactives", "US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants", "US ACGIH Threshold Limit Values (TLV)", "US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides", "US Department of Transportation (DOT) Marine Pollutants - Appendix B", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US EPA Acute Exposure Guideline Levels (AEGs) - Interim", "US EPCRA Section 313 Chemical List", "US List of Lists - Consolidated List of Chemicals Subject to EPCRA, CERCLA and Section 112(r) of the Clean Air Act", "US NIOSH Recommended Exposure Limits (RELs)", "US OSHA List of Highly Hazardous Chemicals, Toxics and Reactives", "US OSHA Permissible Exposure Levels (PELs) - Table Z1", "US RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261", "US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Wastes", "US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory"

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

- Inhalation may produce health damage*.
- Cumulative effects may result following exposure*.

* (limited evidence).

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- Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

A list of reference resources used to assist the committee may be found at:

www.chemwatch.net/references.

- The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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