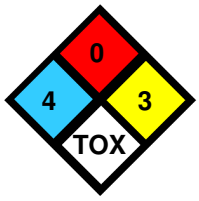
MATERIAL SAFETY DATA SHEET

Osmium (VIII) Oxide

NFPA



HMIS

HEALTH	*4
FLAMMABILITY	0
REACTIVITY	3
PERSONAL PROTECTION	J

1. Product And Company Identification

Supplier
Colonial Metals, Inc.
Building 20
505 Blue Ball Road
Elkton, MD 21921 United States

Company Contact: Michael Doss - Dir. of Regulatory Affairs
Telephone Number: 410-398-7200
FAX Number: 410-398-2918
E-Mail: mdoss@colonialmetals.com
Web Site: www.colonialmetals.com

Manufacturer
Colonial Metals, Inc.
Building 20
505 Blue Ball Road
Elkton, MD 21921 United States

Company Contact: Michael Doss - Dir. of Regulatory Affairs
Telephone Number: 410-398-7200
FAX Number: 410-398-2918
E-Mail: mdoss@colonialmetals.com
Web Site: www.colonialmetals.com

Supplier Emergency Contacts & Phone Number
Chemtrac: 800-424-9300
World Wide - Call COLLECT to U.S: 703-527-3887

Manufacturer Emergency Contacts & Phone Number
Chemtrac: 800-424-9300
World Wide - Call COLLECT to U.S: 703-527-3887

Issue Date: 08/05/2013

Product Name: Osmium (VIII) Oxide
Chemical Name: Osmium Tetroxide, Osmic acid, Osmic Anhydrate, Osmium (VIII) Oxide
CAS Number: 20816-12-0
Chemical Family: Platinum Group Metal Salts
Chemical Formula: OsO4
RCRA Number: P087
MSDS Number: 4008
Product Code: 4008

Synonyms
Osmic Acid, Osmium (VIII) Oxide, Osmic acid anhydride

2. Composition/Information On Ingredients

Ingredient Name	CAS Number		Percent Of Total Weight
Osmium Tetroxide/Osmium Oxide	20816-12-0		99.9

EMERGENCY OVERVIEW

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 DEGREE 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,

EMERGENCY OVERVIEW - Continued

Respiratory sensitiser, Corrosive

Target Organs
Eyes, Central nervous system, Male reproductive system., Kidney

Other hazards which do not result in classification
Lachrymator.

GHS Classification
Acute toxicity, Inhalation (Category 1)
Acute toxicity, Dermal (Category 2)
Acute toxicity, Oral (Category 2)
Skin corrosion (Category 1B)
Serious eye damage (Category 1)
Respiratory sensitization (Category 1)

GHS Label elements, including precautionary statements
Signal Word 'DANGER'
Hazard statement(s)
H300 + H310 Fatal if swallowed or in contact with skin
H314 Causes severe skin burns and eye damage.
H330 Fatal if inhaled.
H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.
Precautionary statement(s)
P260 Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash hands thoroughly after handling.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
P284 Wear respiratory protection.
P302 + P350 IF ON SKIN: Gently wash with plenty of soap and water.
P305 + P351 + P338 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.

Hazards Identification (Pictograms)

3. Hazards Identification

Primary Routes(s) Of Entry

Eyes:	Likely
Inhalation:	Likely
Skin:	Likely
Ingestion:	Likely

Eye Hazards
REDNESS, PAIN, BLURRED VISION, LOSS OF VISION, SEVERE DEEP BURNS.

Skin Hazards
POSSIBLE SKIN DISCOLORATION (green or black), REDNESS, SKIN BURNS, PAIN, BLISTERS. VERY TOXIC IN CONTACT WITH THE SKIN.

3. Hazards Identification - Continued

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.

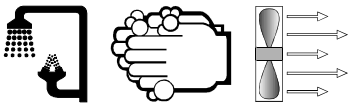
Conditions Aggravated By Exposure

AVOID ALL CONTACT WITH THIS CHEMICAL.

Conditions Aggravated By Overexposure

POTENTIAL KIDNEY DAMAGE.

First Aid (Pictograms)



4. First Aid Measures

Eye

FIRST RINSE WITH PLENTY OF WATER FOR 15 MINUTES. CONTACT A PHYSICIAN IMMEDIATELY.

Skin

RINSE WITH PLENTY OF WATER FOR 15 MINUTES, REMOVE CONTAMINATED CLOTHING AND SHOES AND WASH BEFORE REUSE. CONTACT A PHYSICIAN IMMEDIATELY.

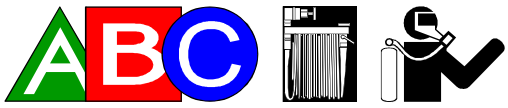
Ingestion

RINSE MOUTH PROVIDED VICTIM IS CONCIOUS. NEVER GIVE ANYTING BY MOUTH TO AN UNCONCIOUS PERSON. GIVE NOTHING TO DRINK. REST. CONTACT A PHYSICIAN IMMEDIATELY.

Inhalation

REMOVE TO FRESH AIR IMMEDIATELY, REST. HALF-UPRIGHT POSITION. ARTIFICIAL RESPIRATION IF INDICATED, CONTACT A PHYSICIAN IMMEDIATELY.

Fire Fighting (Pictograms)



5. Fire Fighting Measures

Flash Point: NA ℃
Flash Point Method: NA
Autoignition Point: NA ℃
Flammability Class: NA

Fire And Explosion Hazards

O4Os 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. Fire Fighting Measures - Continued

Extinguishing Media

Suitable: Carbon dioxide, dry chemical powder, appropriate foam

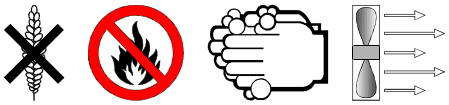
Fire Fighting Instructions

Use NIOSH/MSHA approved self-contained breathing apparatus and full protective clothing.

6. Accidental Release Measures

EVACUATE AREA IMMIEDIATELY! CONSULT AN EXPERT (Onsite HazMat Team or 911). SWEEP SPILLED SUBSTANCE INTO CONTAINERS; IF APPROPRIATE, MOISTEN FIRST TO PREVENT DUSTING THEN REMOVE TO SAFE PLACE. DO NOT ABSORB IN SAW-DUST OR OTHER COMBUSTIBLE MATERIAL. DO NOT LET THIS CHEMICAL ENTER THE ENVIRONMENT (EXTRA PERSONAL PROTECTIVE EQUIPMENT WITH FULL PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS IS A MUST).

Handling & Storage (Pictograms)



7. Handling And Storage

Handling And Storage Precautions

Keep containers tightly closed.
Wash thoroughly after handling.

Handling Precautions

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. Avoid contact with eyes, skin and clothing. Avoid breathing dust or solution spray. Avoid exposure to vapor. Avoid prolonged or repeated exposure. Keep container 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.

Storage Precautions

Keep tightly closed. Do not store directly on ground. Do not store near combustible materials. Keep away from heat, sparks, flame, and other sources of ignition....Store in a cool, dry place.

Work/Hygienic Practices

Wash thoroughly with soap and water after handling. Use good personal hygiene.

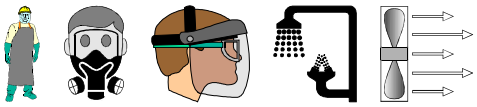
Other Precautions

0.1 mg.m3 supplied air respirator with a full facepiece, any self-contained breathing apparatus with a full facepiece. Any chemical cartridge respirator with a high efficiency particulate filter with a full facepiece and cartridges providing protection against osmic acid. Any air-purifying full facepiece 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 facepiece and operated in a pressure-demand or other positive pressure mode

Emergency or planned entry in unknown concentration or immediately dangerous to life or heath conditions. Any self-contained breathing apparatus with full facepiece 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 1mg/m3

Protective Clothing (Pictograms)



8. Exposure Controls/Personal Protection

Engineering Controls

Ventilation: **Local Exhaust:** Required in handling area
Mechanical: Desirable to insure concentration of material below TLV/TWA levels
Other: Fume Hood

Safety shower and eyewash

Eye/Face Protection

ANSI approved safety glasses/goggles or full face piece with respirator

Skin Protection

Rubber/Neoprene (use compatible 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.

Other/General Protection

Lab coat/apron, flame and chemical resistant protective clothing, eye wash, safety shower, and hygiene facilities for washing.

Ingredient(s) - Exposure Limits

Osmium Tetroxide/Osmium Oxide
NIOSH REL: TWA 0.002 MG/M3 (0.002 PPM) ST 0.006 MG/M3 (0.0006 PPM)
OSHA PEL - TWA 0.002 MG/M3
IDLH: 1 MG/M3 AS (Os)
CONVERSION: 1 PPM = 10.40 MG/M3
NIOSH: RTECS RN1140000

9. Physical And Chemical Properties

Appearance

Colorless yellow solid

Odor

A sharp chlorine like odor

Chemical Type: Mixture
Physical State: Solid
Melting Point: 107.6 °F 39.5-41.0 °C
Boiling Point: 266.0 °F 130 °C
Specific Gravity: 4.9 g/cm3
Molecular Weight: 254.2
Percent Volatiles: NL
Percent VOCs: NL
Packing Density: RELATIVE DENSITY - 4.9
Vapor Pressure: 7 mmHg
Vapor Density: 8.8
pH Factor: NL At a Concentration Of NL

9. Physical And Chemical Properties - Continued

Solubility: 6% @ 77 DEGREE F
Viscosity: NL
Evaporation Rate: NE
NON-COMBUSTIBLE SOLID.

10. Stability And Reactivity

Stability: Stable
Hazardous Polymerization: Will not occur

Conditions To Avoid (Stability)
COMBUSTIBLE MATERIAL, HCl AND OXIDIZED AGENTS.

Incompatible Materials
STRONG REDUCING AGENTS, ORGANIC MATERIALS, FINELY POWDERED METALS, COMBUSTIBLE MATERIAL, AND OXIDIZED AGENTS. CONTACT WITH HYDROCHLORIC ACID WILL CAUSE A FORMATION OF POISONESS CHLORINE GAS.

Hazardous Decomposition Products
BEGINS TO SUBLIME BELOW BOILING POINT AND RELEASES A POISONESS AND IRRITATING VAPOR. CONTACT WITH OTHER MATERIALS MAY CAUSE FIRE.

Conditions To Avoid (Polymerization)
WILL NOT POLYMERIZE.

11. Toxicological Information

Reproductive Effects
Chronic

Species: Rat
Dose: 20336 UMOL/L
Route of Application: Intratesticular
Exposure Time: (1D MALE)
Result paternal effects: Spermatogenesis (including genetic material, sperm morphology, motility, and count).
Paternal effects: Testes, epididymis, sperm duct

Species: Mouse
Dose: 20336 UMOL/L
Route of Application: Subcutaneous
Exposure Time: (30D MALE)
Result paternal effects: Spermatogenesis (including genetic material, sperm morphology, motility, and count).
Paternal effects: Testes, epididymis, sperm duct

Mutagenicity (Genetic Effects)
Chronic

Species: Hamster
Dose: 200 UMOL/L
Cell type: Embryo
Mutation test: Unscheduled DNA synthesis

Conditions Aggravated By Exposure
REPEATED OR PROLONGED CONTACT WITH SKIN MAY CAUSE DERMATITIS. THE SUBSTANCE MAY CAUSE EFFECT ON THE KIDNEY.

11. Toxicological Information - Continued

Conditions Aggravated By Overexposure

REPEATED OR PROLONGED CONTACT WITH SKIN MAY CAUSE DERMATITIS. THE SUBSTANCE MAY CAUSE EFFECT ON THE KIDNEY.

Intraparitoneal
Rat
14100 UG/KG
LD50

Oral
Mouse
162 mg/kg
LD50

Intraparitoneal
Mouse
13500 UG/KG
LD 50

Ecological (Pictograms)

12. Ecological Information

Toxicity - Aquatic And Terrestrial Plants

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

13. Disposal Considerations

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

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

RCRA Information

OsO4 is a listed EPA Hazardous Waste - P087

14. Transport Information

Proper Shipping Name

OSMIUM TETROXIDE

Hazard Class

6.1

Secondary Hazard Class

NA

DOT Identification Number

2471

14. Transport Information - Continued

DOT Shipping Label
Toxic substances

Freight Class
NL

Packaging Exceptions
SEE DOT REGULATIONS

Packaging Requirements
PG I

Additional Shipping Paper Description

IATA REGULATIONS:

IATA REGULATIONS ARE THE SAME AS DOT REGULATIONS, ALWAYS CONSULT IATA HANDBOOK BEFORE SHIPPING.

DOT (Pictograms)

TDG - Canada (Pictograms)

15. Regulatory Information

U.S. Regulatory Information

THIS CHEMICAL IS TSCA LISTED, AND IS ALSO cGMP UNDER FDA FOR IVD TESTING.

SARA Hazard Classes

Acute Health Hazard
Chronic Health Hazard

SARA Section 304 Reportable Quantity: 1000
SARA Title III - Section 313 Form "R"/TRI Reportable Chemical

SARA Section 313 Notification

This compound is subject to the reporting requirements of SARA Section 313.

State Regulations

Massachusetts Right To Know Components
Osmic Acid CAS-No. 20816-12-0

Pennsylvania Right To Know Components
Osmic Acid CAS-No. 20816-12-0

New Jersey Right To Know Components
Osmic Acid CAS-No. 20816-12-0

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

15. Regulatory Information - Continued

Canadian Regulatory Information

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

European Union (EU) Regulatory Information

INDICATION OF DANGER: T +

SYMBOL OF DANGER: VERY TOXIC

RISK #: 26/27/28-34

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

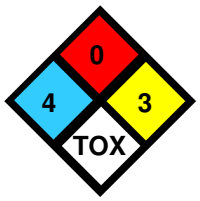
SAFETY #: 7/9-26-45

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

Right-To-Know (Pictograms)

WHMIS - Canada (Pictograms)

NFPA



HMIS

HEALTH	*4
FLAMMABILITY	0
REACTIVITY	3
PERSONAL PROTECTION	J

16. Other Information

Precautionary Label

Oxidizer, Target Organ Effect, Highly toxic by inhalation, Highly toxic by ingestion, Highly toxic by skin absorption, Respiratory sensitiser, Corrosive

Revision/Preparer Information

MSDS Preparer: Michael Doss - Dir Regulatory Affairs
MSDS Preparer Phone Number: 410-398-7200
This MSDS Supersedes A Previous MSDS Dated: 01/02/2003

Osmium (VIII) Oxide

Disclaimer

In compliance with the OSHA Hazard Communication Standard, 2.9 C.F.R 1910.1200, we are providing you with a Materials Safety Data Sheet (MSDS) for the hazardous material you are purchasing.

It is your responsibility to educate your employees on the safe use of the hazardous material. With this in mind, a copy should be forwarded to the supervisor of the user or to the user themselves, and copy should be retained in your files for future reference.

Colonial Metals, Inc. makes no presentation as to the accuracy of the information in the MSDS. The information is believed to be correct; however, you (the customer), should perform your own investigation and independent verification. If you resell the product, you are responsible to forward the information in the MSDS to your customer.

Colonial Metals, Inc.