Osmium tetroxide, 2.5 wt% sol. in tert-butanol, stab. w/ tert butylhydroperoxide

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
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Issue Date: 10/22/2012

Product Name: Osmium tetroxide, 2.5 wt% sol. in tert-butanol, stab. w/ tert butylhydroperoxide
CAS Number: 20816-12-0
Chemical Family: Platinum Group Metal Solution
Chemical Formula: OsO4
MSDS Number: 605589
Product Code: 14034-2.5S
Synonyms
Osmonic acid, osmium teroxide, perosmic oxide

2. Composition/Information On Ingredients

<table>
<thead>
<tr>
<th>Ingredient Name</th>
<th>CAS Number</th>
<th>Percent Of Total Weight</th>
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<tbody>
<tr>
<td>Osmium Tetroxide</td>
<td>20816-12-0</td>
<td>&gt; 98</td>
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</tbody>
</table>

EMERGENCY OVERVIEW


Target Organs: Central nervous system.
Osmium tetroxide, 2.5 wt% sol. in tert-butanol, stab. w/ tert butylhydroperoxide

3. Hazards Identification

Primary Routes(s) Of Entry
Eye: Likely
Inhalation: Likely
Skin: Likely
Ingestion - possible, but considered unlikely.

Eye Hazards
Causes severe eye irritation. Causes eye burns. May cause blindness. May cause lacrimation (tearing), blurred vision, and photophobia. May cause chemical conjunctivitis and corneal damage.

Skin Hazards
Causes skin irritation and possible burns.

Ingestion Hazards
May be fatal if swallowed. Aspiration hazard. Causes cough, sore throat, chest pain, and lightheadedness. May cause nausea, vomiting, abdominal pain, and increased salivation.

Inhalation Hazards
May cause severe irritation of the respiratory tract with sore throat, coughing, shortness of breath and delayed lung edema. May cause bronchopneumonia and possible death. Olfactory fatigue may occur. Can produce delayed pulmonary edema.

Subchronic (Target Organ Effects)
Central Nervous System.

Chronic/Carcinogenicity Effects
Prolonged or repeated skin contact may cause dermatitis. Prolonged or repeated exposure may cause adverse reproductive effects.

4. First Aid Measures

Eye
Immediately flush eyes with plenty of water for at least 15 minutes. Contact a physician immediately.

Skin
Immediately flush skin with plenty of water for at least 15 minutes. Contact a physician immediately. Remove contaminated clothing and shoes and wash before reuse.

Ingestion
Do not induce vomiting. Contact poison control. Give nothing by mouth, unless directed to by a medical professional. Never give anything by mouth to an unconscious person. Contact a physician immediately.

Inhalation
Remove to fresh air immediately. If victim is not breathing provide artificial respiration. If breathing is difficult, give oxygen. Contact a physician immediately.
4. First Aid Measures - Continued

**Note To Physician**
Treat symptomatically and supportively.

**Fire Fighting (Pictograms)**

5. Fire Fighting Measures

**Flash Point:** 39.20 °F 4 °C

**Fire And Explosion Hazards**
Evacuate area and fight fire from a safe distance. As in any fire, wear a self-contained breathing apparatus in pressuredemand, MSHA/NIOSH (approved or equivalent), and full protective gear. Oxidizer. Greatly increases the burning rate of combustible materials. Dust can be an explosion hazard when exposed to heat or flame. Flammable solid. May burn rapidly with flare burning effect. May re-ignite after fire is extinguished.

**Extinguishing Media**
Use CO2 (Carbon Dioxide), dry chemical, or foam.

**Fire Fighting Instructions**
Use NIOSH/MSHA approved self-contained breathing apparatus and full protective clothing. For large fires, use water spray, fog or regular foam. Contact professional fire-fighters immediately. For small fires, use dry chemical, carbon dioxide, sand, earth, water spray or regular foam. Cool containers with flooding quantities of water until well after fire is out.

6. Accidental Release Measures
Reduce airborne dust and prevent scattering by moistening with water. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Remove all sources of ignition. Make sure that the proper PPE is used.

**Handling & Storage (Pictograms)**

7. Handling And Storage

**Handling Precautions**
Use with adequate ventilation. Minimize dust generation and accumulation. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Keep away from heat, sparks and flame. Do not get on skin or in eyes. Do not ingest or inhale. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

**Storage Precautions**
Keep away from heat, sparks, and flame. Keep away from sources of ignition. Do not store near combustible materials. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Poison room locked.

**Work/Hygienic Practices**
Always use good personal hygiene after handling.

**Other Precautions**
7. Handling And Storage - Continued

0.01 ppm high efficiency particular respirator/supplied air respirator/self-contained breathing apparatus; 0.2 ppm same as above with full face piece; 1 ppm powdered air purifying respirator with high efficiency filter/type C supplied air respirator operated in pressure demand mode. Store in a sealed container, plastic or plastic liner, in a cool, well ventilated, dry area away from volatile acids.

<table>
<thead>
<tr>
<th>Protective Clothing (Pictograms)</th>
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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

**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.

9. Physical And Chemical Properties

**Appearance**

Almost white liquid

**Odor**

Chlorine-like stench.

**Chemical Type:** Mixture

**Physical State:** Liquid

**Molecular Weight:** 254.23 as OsO₄

**Vapor Pressure:** 7 mm Hg @ 20°C as Os

**Evaporation Rate:** Negligible

10. Stability And Reactivity

**Stability:** Stable under normal temperatures and pressures

**Hazardous Polymerization:** Will not occur

**Conditions To Avoid (Stability)**

Incompatible materials, ignition sources, dust generation, excess heat.
### 10. Stability And Reactivity - Continued

**Incompatible Materials**
- Strong oxidizing agents, hydrochloric acid, bases, finely powdered metals, organic materials, strong reducing agents.

**Hazardous Decomposition Products**
- Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.

### 11. Toxicological Information

**Reproductive Effects**
- Adverse reproductive effects have occurred in experimental animals.

**Miscellaneous Toxicological Information**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tr>
<td>LD50/ LC50</td>
<td>Oral mouse: LD50 = 162 mg/kg</td>
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**LD50/ LC50**
- CAS # 20816-12-0
- Oral mouse: LD50 = 162 mg/kg

**ACGIH**
- 0.0002 ppm TWA; 0.0006 ppm STEL

**NIOSH**
- 0.0002 ppm TWA; 0.002 mg/m3 TWA 1mg/m3 IDLH (as Os)

**OSHA-Final PELs**
- 0.002 mg/m3 TWA (as Os)

### 12. Ecological Information

No Data Available...

### 13. Disposal Considerations


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

**RCRA Information**
- RCRA P-Series: CAS# 20816-12-0: waste number P087.
- RCRA U-Series: None listed.

### 14. Transport Information

**Proper Shipping Name**
- Toxic Liquid, Flammable, organic, N.O.S. (contains Osmium Tetroxide in t-butanol solution)

**Hazard Class**
- 6.1

**Secondary Hazard Class**
- 3

**DOT Identification Number**
- 2929

**DOT Shipping Label**
- Toxic and Flammable
### 14. Transport Information - Continued

**Packaging Requirements**

- 

**Additional Shipping Paper Description**

  IATA: Same as DOT. Always consult IATA manual before shipping.

**DOT (Pictograms)**

- 

**TDG - Canada (Pictograms)**

- 

### 15. Regulatory Information

**U.S. Regulatory Information**

- TSCA: This product CAS # 20816-12-0 is listed on the TSCA inventory.

**SARA Hazard Classes**

- Acute Health Hazard
- Reactivity Hazard

**SARA Section 313 Notification**

- This material contains OSMIUM TETROXIDE (CAS# 20816-12-0, 100%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

**State Regulations**

- CAS# 20816-12-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

**Canadian Regulatory Information**

- **WGK (Water Danger/Protection)**
  - CAS# 20816-12-0: 2
- **Canada - DSL/NDSL**
  - CAS# 20816-12-0 is listed on Canada's DSL List.
- **Canada - WHMIS**
  - This product has a WHMIS classification of D1A, E. This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

**Canadian Ingredient Disclosure List**

- CAS# 20816-12-0 is listed on the Canadian Ingredient Disclosure List.

**European Union (EU) Regulatory Information**

- **Hazard Symbols:**
  - T+
- **Risk Phrases:**
  - R 26/27/28 Very toxic by inhalation, in contact with skin and if swallowed.
  - R 34 Causes burns.
- **Safety Phrases:**
  - S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
15. Regulatory Information - Continued

**European Union (EU) Regulatory Information - Continued**

| S 45 | In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). |
| S 7/9 | Keep container tightly closed and in a well-ventilated place. |

**CERCLA Hazardous Substances and corresponding RQs**
CAS# 20816-12-0: 1000 lb final RQ; 454 kg final RQ

**SARA Section 302 Extremely Hazardous Substances**
None of the chemicals in this product have a TPQ.

**SARA Codes**
CAS # 20816-12-0: immediate, fire.

**Clean Air Act:**
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

**Clean Water Act:**
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

**OSHA:**
CAS# 20816-12-0 is considered highly hazardous by OSHA.

**WHMIS - Canada (Pictograms)**

**DSCL - Europe (Pictograms)**

**NFPA**

<table>
<thead>
<tr>
<th>FLAMMABILITY</th>
<th>REACTIVITY</th>
<th>HEALTH</th>
<th>PERSONAL PROTECTION</th>
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<tr>
<td>0</td>
<td>3</td>
<td>3</td>
<td>J</td>
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</table>

16. Other Information

**Revision/Preparer Information**
MSDS Preparer: Michael Doss - Dir Reg Affairs
MSDS Preparer Phone Number: 410-398-7200
This MSDS Supersedes A Previous MSDS Dated: 08/18/2008

**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
<table>
<thead>
<tr>
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<tr>
<td>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.</td>
</tr>
<tr>
<td>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.</td>
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Colonial Metals, Inc.