1 Identification

- Product identifier
  - Trade name: Osmium tetroxide
  - Article number: 31251
  - CAS Number: 20816-12-0
  - EC number: 244-058-7
  - Index number: 076-001-00-5
- Application of the substance / the mixture Laboratory chemicals

Details of the supplier of the safety data sheet
- Manufacturer/Supplier:
  SERVA Electrophoresis GmbH
  Carl-Benz-Str. 7
  D-69115 Heidelberg
  Tel.: +49 6221 13840-0
  FAX: +49 6221 13840-10
  msds.info@serva.de
- Information department: Product Safety department Tel.: +49 6221 13840-35
- Emergency telephone number:
  Medical Emergency Information in case of poisoning:
  Poison Information Center Mainz - Phone: +49 (0) 6131 19240
  (advisory service in German or English language)

2 Hazard(s) identification

- Classification of the substance or mixture
  - GHS06
    Acute Tox. 2 H300 Fatal if swallowed.
    Acute Tox. 1 H310 Fatal in contact with skin.
    Acute Tox. 2 H330 Fatal if inhaled.
  - GHS05
    Skin Corr. 1B H314 Causes severe skin burns and eye damage.

- Label elements
  - GHS label elements
    The substance is classified and labeled according to the Globally Harmonized System (GHS).
  - Hazard pictograms GHS05, GHS06
  - Signal word Danger
  - Hazard statements
    Fatal if swallowed, in contact with skin or if inhaled.
    Causes severe skin burns and eye damage.
  - Precautionary statements
    Do not breathe dust.
    Wear protective gloves/protective clothing/eye protection/face protection.
    If swallowed: Immediately call a poison center/doctor.
    If on skin: Wash with plenty of soap and water.

(Contd. on page 2)
Trade name: Osmium tetroxide

IF INHALED: Remove person to fresh air and keep comfortable for breathing.
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Store in a well-ventilated place. Keep container tightly closed.
Dispose of contents/container in accordance with local/regional/national/international regulations.

Classification system:

- NFPA ratings (scale 0 - 4)
  - Health = 4
  - Fire = 0
  - Reactivity = 0

- HMIS-ratings (scale 0 - 4)
  - Health = 4
  - Fire = 0
  - Reactivity = 0

Other hazards:
- Results of PBT and vPvB assessment
  - PBT: PBT - assessment not available.
  - vPvB: vPvB - assessment not available.

3 Composition/information on ingredients

- Chemical characterization: Substances
- CAS No. Description
  - 20816-12-0 osmium tetroxide
- Identification number(s)
  - EC number: 244-058-7
  - Index number: 076-001-00-5
- Description:
  - Empirical formula: Os O₄
  - MW: 254.2

4 First-aid measures

- Description of first aid measures
- General information:
  - Immediately remove any clothing soiled by the product.
  - Remove breathing apparatus only after contaminated clothing have been completely removed.
  - In case of irregular breathing or respiratory arrest provide artificial respiration.
- After inhalation: Supply fresh air and to be sure call for a doctor.
- After skin contact:
  - Immediate wash with copious amounts of water and soap; rinse thoroughly; seek medical advice.
- After eye contact:
  - Rinse opened eye for several minutes under running water. Remove present contact lenses, if easy to do, and continue rinsing. Consult ophthalmologist immediately.
- After swallowing:
  - Do not induce vomiting!
  - Drink copious amounts of water and provide fresh air. Immediately call a doctor.
- Information for doctor:
  - Most important symptoms and effects, both acute and delayed
    - Gastric or intestinal disorders
    - Coughing
    - Breathing difficulty

(Contd. on page 3)
Trade name: Osmium tetroxide

5 Fire-fighting measures

- Extinguishing media
  - Suitable extinguishing agents: CO₂ extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
- Special hazards arising from the substance or mixture
  - During heating or in case of fire poisonous gases are produced.
- Advice for firefighters
  - Protective equipment: Wear self-contained respiratory protective device.
  - Wear fully protective suit.
- Additional information
  - Collect contaminated fire fighting water separately. It must not enter the sewage system.

6 Accidental release measures

- Personal precautions, protective equipment and emergency procedures
  - Wear protective clothing.
  - Ensure adequate ventilation
  - Avoid formation of dust.
  - Do not inhale dusts.
  - Avoid contact with the eyes and skin.
- Environmental precautions: Do not allow to enter sewers/surface or ground water.
- Methods and material for containment and cleaning up:
  - Dispose contaminated material as waste according to item 13.
  - Pick up mechanically.
- Reference to other sections
  - See Section 7 for information on safe handling.
  - See Section 8 for information on personal protection equipment.
  - See Section 13 for disposal information.
- Protective Action Criteria for Chemicals
  - PAC-1: 6.00E-04 ppm
  - PAC-2: 0.0084 ppm
  - PAC-3: 4.0 ppm

7 Handling and storage

- Handling:
  - Precautions for safe handling
    - Ensure good ventilation/exhaustion at the workplace.
    - Open and handle receptacle with care.
  - Information about protection against explosions and fires: Keep respiratory protective device available.
- Conditions for safe storage, including any incompatibilities
- Storage:
  - Requirements to be met by storerooms and receptacles: No special requirements.
  - Information about storage in one common storage facility:
    - Store away from flammable substances.
    - Store away from oxidizing agents.
  - Further information about storage conditions:
    - Store under lock and key and with access restricted to technical experts or their assistants only.
    - Keep receptacle tightly sealed and store in dry conditions.
Trade name: Osmium tetroxide

Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

- Additional information about design of technical systems: No further data; see item 7.
- Control parameters
- Components with limit values that require monitoring at the workplace:

<table>
<thead>
<tr>
<th>Substance</th>
<th>PEL Long-term value</th>
<th>REL Short-term value</th>
<th>REL Long-term value</th>
<th>TLV Short-term value</th>
</tr>
</thead>
<tbody>
<tr>
<td>20816-12-0 osmium tetroxide (80-100%)</td>
<td>0.002* mg/m³ as Os</td>
<td>0.006 mg/m³, 0.0006 ppm</td>
<td>0.002 mg/m³, 0.0002 ppm</td>
<td>0.0047 mg/m³, 0.0006 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0016 mg/m³, 0.0002 ppm</td>
</tr>
</tbody>
</table>

- Additional information: The lists that were valid during the creation were used as basis.

- Exposure controls
- Personal protective equipment:
- General protective and hygienic measures:
  Keep away from foodstuffs, beverages and feed.
  Immediately remove all soiled and contaminated clothing.
  Wash hands before breaks and at the end of work.
  Store protective clothing separately.
  Avoid contact with the eyes and skin.
- Breathing equipment:
  Short term filter device:
  Filter P3
- Protection of hands:
  Neoprene gloves
  Protective gloves
  The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
  Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.
  Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation
- Material of gloves
  The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.
- Penetration time of glove material
  The exact break trough time has to be found out by the manufacturer of the protective gloves and has to be observed.
- For the permanent contact of a maximum of 15 minutes gloves made of the following materials are suitable:
  Chloroprene rubber, CR
  Nitrile rubber, NBR
- Eye protection: Safety glasses
- Body protection: Protective work clothing

9 Physical and chemical properties

- Information on basic physical and chemical properties
- General Information
- Appearance:
  Form: Crystalline
## Trade name: Osmium tetroxide

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>yellow to greenish</td>
</tr>
<tr>
<td>Odor</td>
<td>Pungent</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>Not determined</td>
</tr>
<tr>
<td>pH-value</td>
<td>no information available</td>
</tr>
<tr>
<td>Change in condition</td>
<td></td>
</tr>
<tr>
<td>Melting point/Melting range</td>
<td>40 °C (104 °F)</td>
</tr>
<tr>
<td>Boiling point/Boiling range</td>
<td>130 °C (266 °F)</td>
</tr>
<tr>
<td>Flash point</td>
<td>no information available</td>
</tr>
<tr>
<td>Flammability (solid, gaseous)</td>
<td>Product is not flammable</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>Not determined</td>
</tr>
<tr>
<td>Auto igniting</td>
<td>Not determined</td>
</tr>
<tr>
<td>Danger of explosion</td>
<td>Product does not present an explosion hazard.</td>
</tr>
<tr>
<td>Explosion limits</td>
<td></td>
</tr>
<tr>
<td>Lower</td>
<td>Not determined</td>
</tr>
<tr>
<td>Upper</td>
<td>Not determined</td>
</tr>
<tr>
<td>Vapor pressure at 20 °C (68 °F):</td>
<td>10 hPa (7.5 mm Hg)</td>
</tr>
<tr>
<td>Density at 20 °C (68 °F):</td>
<td>4.91 g/cm³ (40.97395 lbs/gal)</td>
</tr>
<tr>
<td>Relative density</td>
<td>Not determined</td>
</tr>
<tr>
<td>Vapor density</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Solubility in / Miscibility with Water at 20 °C</td>
<td>65 g/l</td>
</tr>
<tr>
<td>Partition coefficient (n-octanol/water):</td>
<td>Not determined</td>
</tr>
<tr>
<td>Viscosity</td>
<td></td>
</tr>
<tr>
<td>Dynamic</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Kinematic</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Other information</td>
<td>No further relevant information available.</td>
</tr>
</tbody>
</table>

### 10 Stability and reactivity

- **Reactivity**: No further relevant information available.
- **Chemical stability**: 
- **Thermal decomposition / conditions to be avoided**: No decomposition if used according to specifications.
- **Possibility of hazardous reactions**: 
  - Reacts with fats and oils.
  - Reacts with flammable substances.
- **Conditions to avoid** high temperatures
- **Incompatible materials**: No further relevant information available.
- **Hazardous decomposition products**: In case of fire: See Section 5
- **Additional information**: 
  - sensitive to light
  - sublimatable
11 Toxicological information

- **Information on toxicological effects**
- **Acute toxicity:**

  - **LD/LC50 values that are relevant for classification:**
    | Oral  | LD50  | 15 mg/kg (rat) |
    | ----- | ----- | ---------------|
    | Inhalative | LC50/4h | 0.42 mg/l (rat) |

- **Primary irritant effect:**
  - **on the skin:** Caustic effect on skin and mucous membranes.
  - **on the eye:** Strong caustic effect.
  - **Sensitization:** No sensitizing effects known.

- **Additional toxicological information:**
  Danger through skin absorption.
  Swallowing will lead to a strong caustic effect on mouth and throat and to the danger of perforation of esophagus and stomach.

- **Carcinogenic categories**
  - **IARC (International Agency for Research on Cancer)** Substance is not listed.
  - **NTP (National Toxicology Program)** Substance is not listed.
  - **OSHA-Ca (Occupational Safety & Health Administration)** Substance is not listed.

12 Ecological information

- **Toxicity**
  - **Aquatic toxicity:** No further relevant information available.
  - **Persistence and degradability** No further relevant information available.

- **Behavior in environmental systems:**
  - **Bioaccumulative potential** No further relevant information available.
  - **Mobility in soil** No further relevant information available.

- **Additional ecological information:**
  - **General notes:**
    Do not allow product to reach ground water, water course or sewage system.
    Water hazard class 3 (Assessment by list): extremely hazardous for water
  - **Results of PBT and vPvB assessment**
    - **PBT:** Not applicable.
    - **vPvB:** Not applicable.
  - **Other adverse effects** No further relevant information available.

13 Disposal considerations

- **Waste treatment methods**
  - **Recommendation:**
    Disposal must be made according to official regulations.
    Must not be disposed of together with household garbage. Do not allow product to reach sewage system.

- **Uncleaned packagings:**
  - **Recommendation:**
    Disposal of uncleaned packagings must be made according to official regulations in the same manner as the product.

- **Recommended cleansing agent:** Water, if necessary with cleansing agents.
### 14 Transport information

- **UN-Number**
  - DOT, ADR, IMDG, IATA: UN2471

- **UN proper shipping name**
  - DOT: Osmium tetroxide
  - ADR: 2471 OSMIUM TETROXIDE
  - IMDG: OSMIUM TETROXIDE, MARINE POLLUTANT
  - IATA: OSMIUM TETROXIDE

- **Transport hazard class(es)**
  - **DOT**
    - Class: 6.1 Toxic substances
    - Label: 6.1
  - **ADR, IATA**
    - Class: 6.1 Toxic substances
    - Label: 6.1
  - **IMDG**
    - Class: 6.1 Toxic substances
    - Label: 6.1

- **Packing group**
  - DOT, ADR, IMDG, IATA: I

- **Environmental hazards:**
  - Marine pollutant: Yes (PP)
  - Symbol (fish and tree)

- **Special precautions for user**
  - Hazard identification number (Kemler code): 66
  - EMS Number: F-A.S-A
  - Stowage Category: B
  - Stowage Code: SW2 Clear of living quarters.

- **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**
  - Not applicable.

- **Transport/Additional information:**
  - DOT: Remarks: Special marking with the symbol (fish and tree).
Safety Data Sheet  
acc. to OSHA HCS

Printing date 03/24/2020  
Reviewed on 03/24/2020

Trade name: Osmium tetroxide

(Contd. of page 7)

- **ADR**
  - Excepted quantities (EQ)  
    Code: E5  
    Maximum net quantity per inner packaging: 1 g  
    Maximum net quantity per outer packaging: 300 g

- **IMDG**
  - Limited quantities (LQ)  
    0
  - Excepted quantities (EQ)  
    Code: E5  
    Maximum net quantity per inner packaging: 1 g  
    Maximum net quantity per outer packaging: 300 g

- **UN “Model Regulation”:**  
  UN 2471 OSMIUM TETROXIDE, 6.1, I

15 Regulatory information

- **Safety, health and environmental regulations/legislation specific for the substance or mixture**
  - Section 355 (extremely hazardous substances); Substance is not listed.
  - Section 313 (Specific toxic chemical listings); Substance is listed.
  - TSCA (Toxic Substances Control Act); ACTIVE
  - Hazardous Air Pollutants Substance is not listed.
  - Proposition 65 Substance is not listed.
  - Chemicals known to cause cancer: Substance is not listed.
  - Chemicals known to cause reproductive toxicity for females: Substance is not listed.
  - Chemicals known to cause reproductive toxicity for males: Substance is not listed.
  - Chemicals known to cause developmental toxicity: Substance is not listed.

- **Carcinogenity categories**
  - EPA (Environmental Protection Agency) Substance is not listed.
  - TLV (Threshold Limit Value established by ACGIH) Substance is not listed.
  - NIOSH-Ca (National Institute for Occupational Safety and Health) Substance is not listed.
  - GHS label elements
    The substance is classified and labeled according to the Globally Harmonized System (GHS).
  - Hazard pictograms GHS05, GHS06
  - Signal word Danger
  - Hazard statements
    Fatal if swallowed, in contact with skin or if inhaled.
    Causes severe skin burns and eye damage.
  - Precautionary statements
    Do not breathe dust.
    Wear protective gloves/protective clothing/eye protection/face protection.
    If swallowed: Immediately call a poison center/doctor.
    If on skin: Wash with plenty of soap and water.
    IF INHALED: Remove person to fresh air and keep comfortable for breathing.
    If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do.
    Continue rinsing.
    Store in a well-ventilated place. Keep container tightly closed.
    Store locked up.
    Dispose of contents/container in accordance with local/regional/national/international regulations.

- **Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

- **Department issuing SDS:** Product safety department
- **Contact:** +49 6221 13840-35

(Contd. on page 9)
Trade name: Osmium tetroxide

- Date of preparation / last revision 03/24/2020 / 4
- Abbreviations and acronyms:
  RID: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail)
  ICAO: International Civil Aviation Organisation
  PBT: persistent, bioaccumulative, toxic substance (REACH)
  vPvB: very persistent, very bioaccumulative substance (REACH)
  REACH: Regulation concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals
  CLP: Regulation on classification, labelling and packaging of substances and mixtures
  bw: body weight
  ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
  IMDG: International Maritime Code for Dangerous Goods
  DOT: US Department of Transportation
  IATA: International Air Transport Association
  PP: Severe Marine Pollutant
  ACGIH: American Conference of Governmental Industrial Hygienists
  EINECS: European Inventory of Existing Commercial 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, Bioaccumulative and Toxic
  vPvB: very Persistent and very Bioaccumulative
  NIOSH: National Institute for Occupational Safety
  OSHA: Occupational Safety & Health
  TLV: Threshold Limit Value
  PEL: Permissible Exposure Limit
  REL: Recommended Exposure Limit
  Acute Tox. 2: Acute toxicity – Category 2
  Acute Tox. 1: Acute toxicity – Category 1
  Skin Corr. 1B: Skin corrosion/irritation – Category 1B

- * Data compared to the previous version altered.