SAFETY DATA SHEET

1. Identification

Product identifier: SELENIUM DIOXIDE

Other means of identification
Product No.: U995

Recommended use and restriction on use
Recommended use: Not available.
Restrictions on use: Not known.

Manufacturer/Importer/Supplier/Distributor Information

Manufacturer
Company Name: Avantor Performance Materials, Inc.
Address: 3477 Corporate Parkway, Suite 200
         Center Valley, PA 18034
Telephone: Customer Service: 855-282-6867
Fax: Contact Person: Environmental Health & Safety
e-mail: info@avantormaterials.com

Emergency telephone number:
24 Hour Emergency: 908-859-2151
Chemtrec: 800-424-9300

2. Hazard(s) identification

Hazard Classification

Health Hazards
Acute toxicity (Oral) Category 3
Acute toxicity (Inhalation - dust and mist) Category 3
Specific Target Organ Toxicity - Repeated Exposure Category 2

Environmental Hazards
Acute hazards to the aquatic environment Category 2
Chronic hazards to the aquatic environment Category 2

Label Elements
Hazard Symbol:

Signal Word: Danger
Hazard Statement: Toxic if swallowed. Toxic if inhaled. May cause damage to organs through prolonged or repeated exposure. Toxic to aquatic life with long lasting effects.

Precautionary Statement

Prevention: Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Do not breathe dust/fume/gas/mist/vapors/spray. Use only outdoors or in a well-ventilated area. Avoid release to the environment.

Response: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Rinse mouth. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/physician. Collect spillage. Get medical advice/attention if you feel unwell.

Storage: Store in a well-ventilated place. Keep container tightly closed. Store locked up.

Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Other hazards which do not result in GHS classification: None.

3. Composition/information on ingredients

<table>
<thead>
<tr>
<th>Chemical Identity</th>
<th>Common name and synonyms</th>
<th>CAS number</th>
<th>Content in percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELENIUM DIOXIDE /SEO2/</td>
<td></td>
<td>7446-08-4</td>
<td>60 - 100%</td>
</tr>
</tbody>
</table>

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

General information: Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.

Ingestion: Call a physician or poison control center immediately. Rinse mouth.

Inhalation: Move to fresh air. Call a physician or poison control center immediately. If breathing stops, provide artificial respiration.

Skin Contact: Wash skin thoroughly with soap and water. Call a physician or poison control center immediately. Wash contaminated clothing before reuse.

Eye contact: Flush thoroughly with water for at least 15 minutes. Get immediate medical assistance. If medical assistance is not immediately available, flush an additional 15 minutes.

Most important symptoms/effects, acute and delayed

Symptoms: Toxic if swallowed. Toxic if inhaled.
Indication of immediate medical attention and special treatment needed

Treatment: Treat symptomatically. Symptoms may be delayed.

5. Fire-fighting measures

General Fire Hazards: In case of fire and/or explosion do not breathe fumes.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: The product is non-combustible. Use fire-extinguishing media appropriate for surrounding materials.

Unsuitable extinguishing media: None known.

Specific hazards arising from the chemical: Contact with metals may evolve flammable hydrogen gas. Fire may produce irritating, corrosive and/or toxic gases.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: Move containers from fire area if you can do so without risk. Use water spray to keep fire-exposed containers cool. Cool containers exposed to flames with water until well after the fire is out.

Special protective equipment for fire-fighters: Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures: Keep unauthorized personnel away. Use personal protective equipment. See Section 8 of the MSDS for Personal Protective Equipment. Ventilate closed spaces before entering them. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Methods and material for containment and cleaning up: Avoid dust formation. Sweep up and place in a clearly labeled container for chemical waste. Clean surface thoroughly to remove residual contamination. Dike far ahead of larger spill for later recovery and disposal.

Notification Procedures: Dike for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Stop the flow of material, if this is without risk. Inform authorities if large amounts are involved.

Environmental Precautions: Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling: Use personal protective equipment as required. Avoid contact with eyes, skin, and clothing. Do not breathe dust/fume/mist. Do not taste or swallow. Do not eat, drink or smoke when using the product. Use only with adequate ventilation. Wash hands thoroughly after handling. See Section 8 of the MSDS for Personal Protective Equipment.

Conditions for safe storage, including any incompatibilities: Keep in a cool, well-ventilated place. Store in a dry place. Keep container tightly closed. Keep away from moisture.
8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

<table>
<thead>
<tr>
<th>Chemical Identity</th>
<th>Type</th>
<th>Exposure Limit Values</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELENIUM DIOXIDE /SEO2/ - as Se</td>
<td>TWA</td>
<td>0.2 mg/m3</td>
<td>US. ACGIH Threshold Limit Values (2011)</td>
</tr>
<tr>
<td></td>
<td>REL</td>
<td>0.2 mg/m3</td>
<td>US. NIOSH: Pocket Guide to Chemical Hazards (2010)</td>
</tr>
<tr>
<td></td>
<td>PEL</td>
<td>0.2 mg/m3</td>
<td>US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>0.2 mg/m3</td>
<td>US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)</td>
</tr>
</tbody>
</table>

Appropriate Engineering Controls

No data available.

Individual protection measures, such as personal protective equipment

- **General information:** Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. An eye wash and safety shower must be available in the immediate work area.

- **Eye/face protection:** Wear safety glasses with side shields (or goggles) and a face shield.

- **Skin Protection**
  - **Hand Protection:** Chemical resistant gloves
  - **Other:** Wear suitable protective clothing.

- **Respiratory Protection:** In case of inadequate ventilation use suitable respirator.

- **Hygiene measures:** Provide eyewash station and safety shower. Observe good industrial hygiene practices. Wash hands before breaks and immediately after handling the product. Do not eat, drink or smoke when using the product. Wash contaminated clothing before reuse.

9. Physical and chemical properties

- **Appearance**
  - **Physical state:** Solid
  - **Form:** Crystalline Powder.
  - **Color:** White, Yellow
  - **Odor:** Pungent, Sour/acidic
  - **Odor threshold:** No data available.
  - **pH:** No data available.
  - **Melting point/freezing point:** 340 °C
  - **Initial boiling point and boiling range:** No data available.
  - **Flash Point:** No data available.
  - **Evaporation rate:** No data available.
  - **Flammability (solid, gas):** No data available.
  - **Upper/lower limit on flammability or explosive limits**
    - Flammability limit - upper (%): No data available.
    - Flammability limit - lower (%): No data available.
**Explosive limit - upper (%):** No data available.
**Explosive limit - lower (%):** No data available.
**Vapor pressure:** 1.6665 kPa (70 °C) 2.693 hPa (94 °C) 113.057 hPa (320 °C)
**Vapor density:** No data available.
**Relative density:** 3.954 (15 °C)
**Solubility(ies):**
- **Solubility in water:** 400 g/l (20 °C)
- **Solubility (other):**
  - benzene: Soluble
  - ethanol: 67 g/l (15 °C)
  - acetone: 44 g/l (15 °C)
  - acetic acid: 11.1 g/l (14 °C)
  - methanol: 101.6 g/l (12 °C)
**Partition coefficient (n-octanol/water):** No data available.
**Auto-ignition temperature:** No data available.
**Decomposition temperature:** No data available.
**Viscosity:** No data available.
**Other information**
- **Molecular weight:** 110.96 g/mol (O2Se)

### 10. Stability and reactivity

**Reactivity:** No dangerous reaction known under conditions of normal use.

**Chemical Stability:** Material is stable under normal conditions.

**Possibility of Hazardous Reactions:** Hazardous polymerization does not occur.

**Conditions to Avoid:** Moisture. Contact with incompatible materials.

**Incompatible Materials:** Strong acids. Organic compounds. Ammonia.

**Hazardous Decomposition Products:** Toxic metal fumes may form when heated to decomposition.

### 11. Toxicological information

**Information on likely routes of exposure**
- **Ingestion:** Toxic if swallowed.
- **Inhalation:** Toxic if inhaled.
- **Skin Contact:** May cause irritation.
- **Eye contact:** May irritate eyes.

**Information on toxicological effects**

**Acute toxicity (list all possible routes of exposure)**
- **Oral**
  - **Product:** LD 50 (Mouse, Male): 16 mg/kg
  - **Product:** LD 50 (Mouse): 23.3 mg/kg
  - **Product:** LD 50 (Rat): 68.1 mg/kg
- **Dermal**
  - **Product:** No data available.
- **Inhalation**
Product: No data available.

Repeated Dose Toxicity
Product: No data available.

Skin Corrosion/Irritation
Product: May cause skin irritation.

Serious Eye Damage/Eye Irritation
Product: May irritate and cause redness and pain.

Respiratory or Skin Sensitization
Product: Not a skin sensitizer.

Carcinogenicity
Product: This substance has no evidence of carcinogenic properties.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

No carcinogenic components identified

Germ Cell Mutagenicity
In vitro
Product: No mutagenic components identified

In vivo
Product: No mutagenic components identified

Reproductive Toxicity
Product: No components toxic to reproduction

Specific Target Organ Toxicity - Single Exposure
Product: No data available.

Specific Target Organ Toxicity - Repeated Exposure
Product: May cause damage to organs through prolonged or repeated exposure.

Aspiration Hazard
Product: Not classified

Other Effects: None known.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish
Product: No data available.

Specified substance(s):
SELENIUM DIOXIDE
/LSE02/

LC 50 (Giant gourami (Colisa fasciata), 24 h): 9.99 mg/l Mortality
LC 50 (Fathead minnow (Pimephales promelas), 24.5 h): 16.4 - 36 mg/l Mortality
LC 50 (Channel catfish (Ictalurus punctatus), 28 h): 37.8 - 42.8 mg/l Mortality
LC 50 (Brook trout (Salvelinus fontinalis), 48 h): 23.8 mg/l Mortality
LC 50 (Goldfish (Carassius auratus), 48 h): 42.6 - 50.7 mg/l Mortality

Aquatic Invertebrates
Product: No data available.

Specified substance(s):
SELENIUM DIOXIDE /SEO2/
LC 50 (Crab (Scylla serrata), 24 h): 68 mg/l Mortality
LC 50 (Dungeness or edible crab (Cancer magister), 24 h): > 10 mg/l Mortality
LC 50 (Crab (Scylla serrata), 96 h): 28.4 - 38.26 mg/l Mortality

Chronic hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic Invertebrates
Product: No data available.

Toxicity to Aquatic Plants
Product: No data available.

Persistence and Degradability

Biodegradation
Product: There are no data on the degradability of this product.

BOD/COD Ratio
Product: No data available.

Bioaccumulative Potential
Bioconcentration Factor (BCF)
Product: No data available on bioaccumulation.

Partition Coefficient n-octanol / water (log Kow)
Product: No data available.

Mobility in Soil: No data available.

Other Adverse Effects: Toxic to aquatic life with long lasting effects.

13. Disposal considerations

Disposal instructions: Discharge, treatment, or disposal may be subject to national, state, or local laws.

Contaminated Packaging: Since emptied containers retain product residue, follow label warnings even after container is emptied.
14. Transport information

**DOT**

- **UN Number:** UN 3283
- **UN Proper Shipping Name:** Selenium compound, solid, n.o.s. (SELENIUM DIOXIDE)
- **Transport Hazard Class(es):** 6.1
- **Label(s):** 6.1
- **Packing Group:** I
- **Marine Pollutant:** No

**IMDG**

- **UN Number:** UN 3283
- **UN Proper Shipping Name:** SELENIUM COMPOUND, SOLID, N.O.S. (SELENIUM DIOXIDE)
- **Transport Hazard Class(es):** 6.1
- **Label(s):** 6.1
- **EmS No.:** F-A, S-A
- **Packing Group:** I
- **Marine Pollutant:** No

**IATA**

- **UN Number:** UN 3283
- **Proper Shipping Name:** Selenium compound, solid, n.o.s. (SELENIUM DIOXIDE)
- **Transport Hazard Class(es):** 6.1
- **Label(s):** 6.1
- **Marine Pollutant:** No
- **Packing Group:** I

15. Regulatory information

**US Federal Regulations**

- **TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)**
  - None present or none present in regulated quantities.
  - None present or none present in regulated quantities.

**CERCLA Hazardous Substance List (40 CFR 302.4):**

SELENIUM DIOXIDE /SEO2/  Reportable quantity: 10 lbs.

**Superfund Amendments and Reauthorization Act of 1986 (SARA)**

- **Hazard categories**
  - [X] Acute (Immediate)
  - [X] Chronic (Delayed)
  - [ ] Fire
  - [ ] Reactive
  - [ ] Pressure Generating

- **SARA 302 Extremely Hazardous Substance**
  - None present or none present in regulated quantities.

- **SARA 304 Emergency Release Notification**
  - **Chemical Identity**
    - SELENIUM DIOXIDE /SEO2/
  - **RQ**
    - 10 lbs.
SARA 311/312 Hazardous Chemical
Chemical Identity | Threshold Planning Quantity
SELENIUM DIOXIDE /SEO2/ | 500 lbs

SARA 313 (TRI Reporting)

<table>
<thead>
<tr>
<th>Chemical Identity</th>
<th>Reporting threshold for other users</th>
<th>Reporting threshold for manufacturing and processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELENIUM DIOXIDE /SEO2/</td>
<td>10000 lbs</td>
<td>25000 lbs.</td>
</tr>
</tbody>
</table>

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)
SELENIUM DIOXIDE /SEO2/ Reportable quantity: 10 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):
None present or none present in regulated quantities.

US State Regulations

US. California Proposition 65
No ingredient regulated by CA Prop 65 present.

US. New Jersey Worker and Community Right-to-Know Act
SELENIUM DIOXIDE /SEO2/ Listed

US. Massachusetts RTK - Substance List
SELENIUM DIOXIDE Listed /SEO2/

US. Pennsylvania RTK - Hazardous Substances
SELENIUM DIOXIDE Listed /SEO2/

US. Rhode Island RTK
SELENIUM DIOXIDE Listed /SEO2/

Inventory Status:
Australia AICS: On or in compliance with the inventory
Canada DSL Inventory List: On or in compliance with the inventory
EINECS, ELINCS or NLP: On or in compliance with the inventory
Japan (ENCS) List: On or in compliance with the inventory
China Inv. Existing Chemical Substances: On or in compliance with the inventory
Korea Existing Chemicals Inv. (KECL): On or in compliance with the inventory
Canada NDSL Inventory: Not in compliance with the inventory.
Philippines PICCS: On or in compliance with the inventory
US TSCA Inventory: On or in compliance with the inventory
New Zealand Inventory of Chemicals: On or in compliance with the inventory
Japan ISHL Listing: On or in compliance with the inventory
Japan Pharmacopoeia Listing: Not in compliance with the inventory.

16. Other information, including date of preparation or last revision

NFPA Hazard ID

Flammability
Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe

Issue Date: 12-01-2014
Revision Date: No data available.
Version #: 1.0
Further Information: No data available.

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