SAFETY DATA SHEET
SDS-730-rev2 Issue Date: 07/20/2017

YTTRIUM-STABILIZED ZIRCONIA MICROSPHERES, SPHERES AND BEADS

1. IDENTIFICATION OF SUBSTANCE
1.1 PRODUCT NAME(S) Yttrium-Stabilized Zirconia Microspheres, Spheres and Beads
1.2 PRODUCT IDENTIFIER(S) YSZMS, YSZS, YSZB
1.3 INTENDED USE Industrial and research applications
1.4 SUPPLIER’S DETAILS Cospheric LLC, PO Box 6762, Santa Barbara, CA 93160
info@cospheric.com www.cospheric.com
1.5 EMERGENCY TELEPHONE +1-805-687-3747 Monday-Friday, 08:00-17:00 PST [UTC-8]

2. HAZARDS IDENTIFICATION
2.1 HAZARD CLASSIFICATION Not classified as a hazardous material.
2.2 GHS LABEL ELEMENTS
   Signal word Warning
   Hazard statements Dust may cause skin, eye and respiratory irritation.
   Precautionary statements Avoid exposure to dust. Use suitable personal protective equipment.
2.3 HAZARDS NOT OTHERWISE CLASSIFIED Spilled material is extremely slippery.

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>INGREDIENT</th>
<th>CAS NUMBER</th>
<th>% (W/W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zirconium Dioxide, Yttrium Stabilized</td>
<td>114168-16-0</td>
<td>&gt;99%</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES
4.1 DESCRIPTION OF FIRST AID MEASURES
   Eye contact Rinse with plenty of water. Seek medical advice if symptoms persist.
   Skin contact If symptoms occur, wash with soap and water.
   Inhalation If symptoms occur, move to fresh air. Seek medical advice if necessary.
   Ingestion If symptoms occur, seek medical advice.
4.2 IMPORTANT SYMPTOMS/EFFECTS, ACUTE OR DELAYED
   Inhalation of high concentrations of dust may cause respiratory irritation.

5. FIRE-FIGHTING MEASURES
5.1 EXTINGUISHING MEDIA
   Use extinguishing measures that are appropriate to local circumstances and the surrounding fire.
5.2 SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE
   None known.
5.3 SPECIAL PROTECTIVE ACTIONS FOR FIRE-FIGHTERS
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As in any fire, wear self-contained breathing apparatus pressure-demand (NIOSH approved) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

6.1 PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Follow precautions for safe handling described in this safety data sheet (Section 8).

6.2 ENVIRONMENTAL PRECAUTIONS

Dispose of any waste according to prescribed federal, state, local and competent authority guidelines.

6.3 METHODS AND MATERIAL FOR CONTAINMENT AND CLEAN UP

Collect spillage with shovel, broom or the like. Transfer to a container for disposal.

7. HANDLING AND STORAGE

7.1 PRECAUTIONS FOR SAFE HANDLING

Avoid handling practices that cause dust formation. Avoid inhalation of high concentrations of dust. Observe occupational exposure limits and minimize the risk of inhalation of dust.

7.2 CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Store in tightly closed original container in a dry, cool and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 CONTROL PARAMETERS

This product is not a hazardous material. The exposure limit for nuisance dust is referenced.

Nuisance Dust (Particles Not Otherwise Regulated)

<table>
<thead>
<tr>
<th>OSHA Permissible Exposure Limit (PEL)</th>
<th>Respirable fraction</th>
<th>5mg/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total dust</td>
<td>15mg/m³</td>
</tr>
<tr>
<td>Zirconium and compounds</td>
<td>Inhalable fraction</td>
<td>1 (mg/m³)</td>
</tr>
</tbody>
</table>

8.2 ENGINEERING CONTROLS

Avoid handling practices that cause dust formation. Use local exhaust ventilation to prevent or control exposure.

8.3 INDIVIDUAL PROTECTION MEASURES (PERSONAL PROTECTIVE EQUIPMENT)

Respiratory protection: When handling practices cause dust formation, select respiratory protection appropriate for the particle size of the material.

Eye/face protection: Chemical goggles.

Skin protection: Wear suitable protective clothing and gloves.

9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Solid spherical particles</td>
</tr>
<tr>
<td>Relative density</td>
<td>Per product specification</td>
</tr>
</tbody>
</table>
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Softening Temperature  Per product specification
Flammability  Not classified as flammable.
Flammable limits  Not-applicable
Auto-ignition temperature  Not-applicable
Decomposition temperature  No information available
Odor  Odorless
Vapor pressure  Not-applicable
Vapor density  Not-applicable
pH  Not-applicable
Melting point  Not-applicable
Solubility in water  Insoluble
Initial boiling point  Not-applicable
Flash point  Not-applicable
Evaporation rate  Not-applicable
Partition coefficient  Not-applicable
Viscosity  Not-applicable

10. STABILITY AND REACTIVITY
Reactivity  Non-reactive under normal conditions of use.
Chemical stability  Stable under normal conditions of use.

11. TOXICOLOGICAL INFORMATION
Likely route(s) of exposure  Dermal, inhalation

SIGNS AND SYMPTOMS OF EXPOSURE

<table>
<thead>
<tr>
<th>Eye contact</th>
<th>Skin contact</th>
<th>Inhalation</th>
<th>Ingestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct contact with eyes may cause temporary mechanical irritation. Signs and symptoms may include pain, redness.</td>
<td>Direct contact with skin may cause sensitization in hypersensitive individuals. Signs and symptoms may include redness, pain and itching.</td>
<td>Inhalation above recommended exposure levels may cause respiratory irritation including cough.</td>
<td>No harmful effects expected in amounts likely to be ingested by accident. May cause discomfort if swallowed.</td>
</tr>
</tbody>
</table>

TOXICOLOGICAL DATA

<table>
<thead>
<tr>
<th>Acute toxicity</th>
<th>Ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zirconium oxide</td>
<td>LD50</td>
<td>Rat-Oral</td>
<td>&gt; 5000 mg/kg</td>
<td></td>
</tr>
</tbody>
</table>
Yttrium oxide LD\textsubscript{50} Rat-Oral > 5000 mg/kg

<table>
<thead>
<tr>
<th>Property</th>
<th>Result</th>
<th>Species</th>
<th>Dose</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin corrosion/irritation</td>
<td>No information available/not sufficient for classification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serious eye damage/eye irritation</td>
<td>No information available/not sufficient for classification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory or skin sensitization</td>
<td>No information available/not sufficient for classification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germ cell mutagenicity</td>
<td>No information available/not sufficient for classification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>Not listed as a carcinogen (OSHA, NTP, IARC)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reproductive toxicity</td>
<td>No information available/not sufficient for classification</td>
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<td></td>
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<tr>
<td>STOT-single exposure</td>
<td>No information available/not sufficient for classification</td>
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<td></td>
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<tr>
<td>STOT-repeated exposure</td>
<td>No information available/not sufficient for classification</td>
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<td></td>
<td></td>
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<tr>
<td>Aspiration hazard</td>
<td>No information available/not sufficient for classification</td>
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</tbody>
</table>

12. ECOLOGICAL INFORMATION

<table>
<thead>
<tr>
<th>Property</th>
<th>Ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Dose</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toxicity</td>
<td>Zirconium oxide</td>
<td>LD\textsubscript{50}</td>
<td>Danio rerio</td>
<td>&gt;100 mg/L</td>
<td>96 hr</td>
</tr>
<tr>
<td></td>
<td>Yttrium oxide</td>
<td>LD\textsubscript{50}</td>
<td>Danio rerio</td>
<td>&gt;100 mg/L</td>
<td>96 hr</td>
</tr>
<tr>
<td>Persistence and degradability</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Bioaccumulation potential</td>
<td></td>
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<tr>
<td>Mobility in soil</td>
<td></td>
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</tbody>
</table>

13. DISPOSAL CONSIDERATIONS

Dispose of any waste according to prescribed federal, state, local and competent authority guidelines.

14. TRANSPORTATION INFORMATION

This product is not subject to regulations for the transport of hazardous materials (DOT, IATA, IMO).

15. REGULATORY INFORMATION

This SDS has been prepared to meet the US OHSA Hazard Communication Standard, 29 CFR 1910.1200.

16. OTHER INFORMATION

The information contained in this document is correct to the best of our knowledge at the date of publication. It should not be viewed as all inclusive, but as a guide only. It does not represent any guarantee of the properties of the product. Cospheric LLC shall not be held liable for any damage resulting from handling of or from contact with the above product. For these reasons, it is important that product users carry out their own tests to satisfy themselves as to the suitability of the safety precautions for their own intended applications.

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