Section 1: Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product identifier

Product Name

AZ Code 9306,1368, #290

1.2 Relevant identified uses of the substance or mixture and uses advised against

Relevant identified use(s)

TSP

1.3 Details of the supplier of the safety data sheet

Manufacturer

Saint-Gobain

One New Bond St.
Mail Stop 525-203 Worcester, MA 01615-0137
United States
http://www.ceramicmaterials.saint-gobain.com
cermatworcester@saint-gobain.com

Telephone (General)

1-800-243-0028

1.4 Emergency telephone number

Manufacturer

800-535-5053 - Infotrac Inc.

Manufacturer

800-424-9300 - CHEMTREC

Section 2: Hazards Identification

EU/EEC


2.1 Classification of the substance or mixture

CLP

Not classified

2.2 Label Elements

CLP

Hazard statements

No label element(s) required

2.3 Other Hazards

CLP

According to Regulation (EC) No. 1272/2008 (CLP) this material is not considered hazardous.
UN GHS
According to: UN Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

2.1 Classification of the substance or mixture
UN GHS
• Not classified

2.2 Label elements
UN GHS
Hazard statements • No label element(s) required

2.3 Other hazards
UN GHS
• According to the Globally Harmonized System for Classification and Labeling (GHS) this product does not meet the criteria necessary to be considered hazardous.

United States (US)
According to: OSHA 29 CFR 1910.1200 HCS

2.1 Classification of the substance or mixture
OSHA HCS 2012
• Not classified

2.2 Label elements
OSHA HCS 2012
Hazard statements • No label element(s) required

2.3 Other hazards
OSHA HCS 2012
• This product is not considered hazardous under the U.S. OSHA 29 CFR 1910.1200 Hazard Communication Standard.

Canada
According to: WHMIS

2.1 Classification of the substance or mixture
WHMIS
• Not classified

2.2 Label elements
WHMIS
• No label element(s) required.

2.3 Other hazards
WHMIS
• In Canada, the product mentioned above is not considered hazardous under the Workplace Hazardous Materials Information System (WHMIS).

Section 3 - Composition/Information on Ingredients

3.1 Substances
• Material does not meet the criteria of a substance.

3.2 Mixtures
## Composition

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Identifiers</th>
<th>%</th>
<th>LD50/LC50</th>
<th>Classifications According to Regulation/Directive</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum oxide</td>
<td>CAS:1344-28-1 EC Number:215-691-6</td>
<td>50% TO 80%</td>
<td>Inhalation-Rat LC50 • 0.2 mg/L 5 Hour(s) 28 Week(s)</td>
<td>UN GHS: Not Classified EU CLP: Not Classified OSHA HCS 2012: Not Classified</td>
<td>NDA</td>
</tr>
<tr>
<td>Zirconium oxide</td>
<td>CAS:1314-23-4 EC Number:215-227-2</td>
<td>20% TO 45%</td>
<td>NDA</td>
<td>UN GHS: Not Classified EU CLP: Not Classified OSHA HCS 2012: Not Classified</td>
<td>NDA</td>
</tr>
<tr>
<td>Hafnium oxide</td>
<td>CAS:12055-23-1 EINECS:235-013-2</td>
<td>0% TO 1%</td>
<td>NDA</td>
<td>UN GHS: Eye Irrit. 2; Skin Irrit. 3 EU CLP: Not Classified OSHA HCS 2012: Eye Irrit. 2</td>
<td>NDA</td>
</tr>
</tbody>
</table>

## Section 4 - First Aid Measures

### 4.1 Description of first aid measures

**Inhalation**
- Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. If signs/symptoms continue, get medical attention.

**Skin**
- In case of contact with substance, immediately flush skin with running water for at least 20 minutes. If irritation develops and persists, get medical attention.

**Eye**
- In case of contact with substance, immediately flush eyes with running water for at least 20 minutes. If eye irritation persists: Get medical advice/attention.

**Ingestion**
- Rinse mouth. Do not give anything by mouth to an unconscious person. Do NOT induce vomiting. Get medical attention.

### 4.2 Most important symptoms and effects, both acute and delayed

- Refer to Section 11 - Toxicological Information.

### 4.3 Indication of any immediate medical attention and special treatment needed

**Notes to Physician**
- All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

## Section 5 - Firefighting Measures

### 5.1 Extinguishing media

**Suitable Extinguishing Media**
- In case of fire use media as appropriate for surrounding fire.

**Unsuitable Extinguishing Media**
- No data available

### 5.2 Special hazards arising from the substance or mixture

**Unusual Fire and Explosion Hazards**
- None known.

**Hazardous Combustion Products**
- No data available

### 5.3 Advice for firefighters

- Fire fighters should wear full-face, self-contained breathing apparatus and impervious protective clothing.
- Fire fighters should avoid inhaling any combustion products.

## Section 6 - Accidental Release Measures
6.1 Personal precautions, protective equipment and emergency procedures

Personal Precautions
- Ventilate enclosed areas. Take proper precautions to minimize exposure by using appropriate personal protective equipment.

Emergency Procedures
- Stay upwind. As an immediate precautionary measure, isolate spill or leak area for at least 25 meters (75 feet) in all directions. Keep unauthorized personnel away.

6.2 Environmental precautions
- Avoid release to the environment.

6.3 Methods and material for containment and cleaning up

Containment/Clean-up Measures
- Avoid generating dust.
  SMALL DRY SPILLS: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
  LARGE SPILLS: Cover powder spill with plastic sheet or tarp to minimize spreading.

6.4 Reference to other sections
- Refer to Section 8 - Exposure Controls/Personal Protection and Section 13 - Disposal Considerations.

Section 7 - Handling and Storage

7.1 Precautions for safe handling

Handling
- Use only with adequate ventilation. Minimize dust generation and accumulation. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Wear appropriate personal protective equipment, avoid direct contact. Avoid breathing dust. Avoid contact with skin, eyes, and clothing. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco.

7.2 Conditions for safe storage, including any incompatibilities

Storage
- Keep container tightly closed. Store in a cool, dry, well-ventilated place.

7.3 Specific end use(s)
- Refer to Section 1.2 - Relevant identified uses.

Section 8 - Exposure Controls/Personal Protection

8.1 Control parameters

<table>
<thead>
<tr>
<th></th>
<th>Exposure Limits/Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ACGIH</td>
</tr>
<tr>
<td></td>
<td>China</td>
</tr>
<tr>
<td></td>
<td>Denmark</td>
</tr>
<tr>
<td></td>
<td>Finland</td>
</tr>
<tr>
<td></td>
<td>France</td>
</tr>
<tr>
<td>Hafnium oxide</td>
<td>TWAs 0.5 mg/m³ TWA (as Hf) as Hafnium compounds Not established Not established 0.5 mg/m³ TWA (as Hf) as Hafnium compounds Not established</td>
</tr>
<tr>
<td>Zirconium oxide</td>
<td>STELs 10 mg/m³ STEL (as Zr) as Zirconium compounds 10 mg/m³ STEL (as Zr) as Zirconium compounds Not established Not established Not established</td>
</tr>
<tr>
<td></td>
<td>TWAs 5 mg/m³ TWA (as Zr) as Zirconium compounds 5 mg/m³ TWA (as Zr) as Zirconium compounds Not established Not established Not established</td>
</tr>
<tr>
<td></td>
<td>STELs 8 mg/m³ STEL (total dust) Not established Not established Not established Not established</td>
</tr>
<tr>
<td></td>
<td>1 mg/m³ TWA</td>
</tr>
<tr>
<td>Aluminum oxide (1344-28-1)</td>
<td>TWAs</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td></td>
<td>(respirable fraction) as Aluminum insoluble compounds</td>
</tr>
<tr>
<td></td>
<td>TWAs</td>
</tr>
<tr>
<td></td>
<td>STELs</td>
</tr>
<tr>
<td></td>
<td>MAKs</td>
</tr>
</tbody>
</table>

Exposure Limits/Guidelines (Cont.)

<table>
<thead>
<tr>
<th>Result</th>
<th>Germany DFG</th>
<th>Greece</th>
<th>Hungary</th>
<th>Ireland</th>
<th>NIOSH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hafnium oxide</td>
<td>TWAs Not established</td>
<td>Not established</td>
<td>Not established</td>
<td>Not established</td>
<td>0.5 mg/m³ TWA (as Hf) as Hafnium compounds</td>
</tr>
<tr>
<td>TWAs Not established</td>
<td>5 mg/m³ TWA (as Zr) as Zirconium compounds</td>
<td>5 mg/m³ TWA [AK] (as Zr) as Zirconium compounds</td>
<td>5 mg/m³ TWA (as Zr) as Zirconium compounds</td>
<td>5 mg/m³ TWA (except Zirconium tetrachloride, as Zr) as Zirconium compounds</td>
<td></td>
</tr>
<tr>
<td>STELs Not established</td>
<td>10 mg/m³ STEL (as Zr) as Zirconium compounds</td>
<td>20 mg/m³ STEL [CK] (as Zr) as Zirconium compounds</td>
<td>10 mg/m³ STEL (except Zirconium tetrachloride, as Zr) as Zirconium compounds</td>
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<td></td>
</tr>
<tr>
<td>Aluminum oxide (1344-28-1)</td>
<td>TWAs Not established</td>
<td>10 mg/m³ TWA (inhalable fraction); 5 mg/m³ TWA (respirable fraction)</td>
<td>6 mg/m³ TWA [AK] (respirable dust)</td>
<td>Not established</td>
<td>Not established</td>
</tr>
<tr>
<td>MAKs Not established</td>
<td>4 mg/m³ TWA MAK (dust, inhalable fraction); 1.5 mg/m³ TWA MAK (dust, respirable fraction)</td>
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<td>Not established</td>
<td>Not established</td>
<td>Not established</td>
</tr>
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</table>

Exposure Limits/Guidelines (Cont.)

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<thead>
<tr>
<th>Result</th>
<th>OSHA</th>
<th>Poland</th>
<th>Portugal</th>
<th>Spain</th>
<th>Sweden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hafnium oxide</td>
<td>TWAs Not established</td>
<td>0.5 mg/m³ TWA [NDS] (as Hf) as Hafnium compounds</td>
<td>0.5 mg/m³ TWA [VLE-MP] (as Hf) as Hafnium compounds</td>
<td>0.5 mg/m³ TWA [VLA-ED] (as Hf) as Hafnium compounds</td>
<td>Not established</td>
</tr>
<tr>
<td>STELs Not established</td>
<td>10 mg/m³ STEL [NDSCH] (as Zr) as Zirconium compounds</td>
<td>10 mg/m³ STEL [VLE-CD] (as Zr) as Zirconium compounds</td>
<td>10 mg/m³ STEL [VLA-EC] (as Zr) as Zirconium compounds</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>TWAs 5 mg/m³ TWA (as Zr) as Zirconium compounds</td>
<td>5 mg/m³ TWA [NDS] (as Zr) as Zirconium compounds</td>
<td>5 mg/m³ TWA [VLE-MP] (as Zr) as Zirconium compounds</td>
<td>5 mg/m³ TWA [VLA-ED] (as Zr) as Zirconium compounds</td>
<td>Not established</td>
<td></td>
</tr>
<tr>
<td>Aluminum oxide (1344-28-1)</td>
<td>TWAs 15 mg/m³ TWA (total dust); 5 mg/m³ TWA (respirable fraction)</td>
<td>2.5 mg/m³ TWA [NDS] (inhalable fraction, as Al); 1.2 mg/m³ TWA [NDS] (respirable fraction, as Al)</td>
<td>10 mg/m³ TWA [VLE-MP] (particulate matter containing no Asbestos and &lt; 1% Crystalline silica)</td>
<td>10 mg/m³ TWA [VLA-ED]</td>
<td>5 mg/m³ LLV (total dust, as Al); 2 mg/m³ LLV (respirable dust, as Al)</td>
</tr>
</tbody>
</table>
Exposure Control Notations

Portugal
• Zirconium oxide as Zirconium compounds: **Carcinogens**: (A4 - Not Classifiable as a Human Carcinogen)
• Aluminum oxide (1344-28-1): **Carcinogens**: (A4 - Not Classifiable as a Human Carcinogen)

ACGIH
• Zirconium oxide as Zirconium compounds: **Carcinogens**: (A4 - Not Classifiable as a Human Carcinogen)
• Aluminum oxide as Aluminum insoluble compounds: **Carcinogens**: (A4 - Not Classifiable as a Human Carcinogen)

Germany DFG
• Aluminum oxide (1344-28-1): **Carcinogens**: (Category 2 (considered to be carcinogenic for man, fibre dust)) | **Pregnancy**: (classification not yet possible (respirable, inhalable, dust))

Exposure Limits Supplemental

ACGIH
• Aluminum oxide as Aluminum insoluble compounds: **TLV Basis - Critical Effects**: (pneumoconiosis; lower respiratory tract irritation; neurotoxicity)
• Hafnium oxide as Hafnium compounds: **TLV Basis - Critical Effects**: (eye and upper respiratory tract irritation; liver damage)

8.2 Exposure controls

Engineering Measures/Controls
• Good general ventilation 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. Ensure that dust handling systems (such as exhaust ducts, dust collectors, vessels and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is not leakage from the equipment).

Personal Protective Equipment

Respiratory
• For limited exposure use an N95 dust mask. For prolonged exposure use an air-purifying respirator with high efficiency particulate air (HEPA) filters. Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.

Eye/Face
• Wear safety goggles.

Skin/Body
• Wear appropriate gloves. Wear long sleeves and/or protective coveralls.

Environmental Exposure Controls
• Follow best practice for site management and disposal of waste. Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

Key to abbreviations

ACGIH = American Conference of Governmental Industrial Hygiene
MAK = Maximale Arbeitsplatz Konzentration is the maximum permissible concentration
NIOSH = National Institute of Occupational Safety and Health
OSHA = Occupational Safety and Health Administration

STEL = Short Term Exposure Limits are based on 15-minute exposures
TLV = Threshold Limit Value determined by the American Conference of Governmental Industrial Hygienists (ACGIH)
TWA = Time-Weighted Averages are based on 8h/day, 40h/week exposures

Section 9 - Physical and Chemical Properties

9.1 Information on Physical and Chemical Properties

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Physical Form</th>
<th>Solid</th>
<th>Appearance/Description</th>
<th>Grayish powder.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Grayish</td>
<td>Odor</td>
<td>Data lacking</td>
<td></td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>Data lacking</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| General Properties   |               |       |                        |                 |
9.2 Other Information

- No additional physical and chemical parameters noted.

Section 10: Stability and Reactivity

10.1 Reactivity

- No dangerous reaction known under conditions of normal use.

10.2 Chemical stability

- Stable under normal temperatures and pressures.

10.3 Possibility of hazardous reactions

- Hazardous polymerization not indicated.

10.4 Conditions to avoid

- No data available

10.5 Incompatible materials

- No data available

10.6 Hazardous decomposition products

- No data available

Section 11 - Toxicological Information

11.1 Information on toxicological effects

<table>
<thead>
<tr>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aluminum oxide (70% TO 80%)</strong> 1344-28-1  Multi-dose Toxicity: Inhalation-Rat TCLo • 200 mg/m³ 5 Hour(s) 28 Week(s)-Intermittent; Lungs, Thorax, or Respiration:Structural or functional change in trachea or bronchi; Lungs, Thorax, or Respiration:Chronic pulmonary edema; Related to Chronic Data:Death in the Other Multiple Dose data type field; Tumorigen / Carcinogen: Implant-Rat • 200 mg/kg; Tumorigenic:Equivocal tumorigenic agent by RTECS criteria; Tumorigenic:Tumors at site of application; Implant-Rat TDLo • 200 mg/kg; Tumorigenic:Neoplastic by RTECS criteria; Tumorigenic:Tumors at site of application; Intrapleural-Rat TDLo • 90 mg/kg; Tumorigenic:Equivocal tumorigenic agent by RTECS criteria; Lungs, Thorax, or Respiration:Tumors</td>
</tr>
<tr>
<td>Potential Health Effects</td>
</tr>
<tr>
<td>----------------------------------------------</td>
</tr>
<tr>
<td><strong>Inhalation</strong></td>
</tr>
<tr>
<td>Acute (Immediate)</td>
</tr>
<tr>
<td>• Nuisance dust may affect the lungs but reactions are typically reversible.</td>
</tr>
<tr>
<td>Chronic (Delayed)</td>
</tr>
<tr>
<td>• No data available</td>
</tr>
<tr>
<td><strong>Skin</strong></td>
</tr>
<tr>
<td>Acute (Immediate)</td>
</tr>
<tr>
<td>• Exposure to dust may cause mechanical irritation.</td>
</tr>
<tr>
<td>Chronic (Delayed)</td>
</tr>
<tr>
<td>• No data available</td>
</tr>
<tr>
<td><strong>Eye</strong></td>
</tr>
<tr>
<td>Acute (Immediate)</td>
</tr>
<tr>
<td>• Excessive concentrations of nuisance dust in the workplace may reduce visibility and may cause unpleasant deposits in eyes.</td>
</tr>
<tr>
<td>Chronic (Delayed)</td>
</tr>
<tr>
<td>• No data available</td>
</tr>
<tr>
<td><strong>Ingestion</strong></td>
</tr>
<tr>
<td>Acute (Immediate)</td>
</tr>
<tr>
<td>• Excessive concentrations of nuisance dust in the workplace may cause mechanical irritation to mucous membranes.</td>
</tr>
</tbody>
</table>
Section 12 - Ecological Information

12.1 Toxicity

- Material data lacking.

12.2 Persistence and degradability

- Material data lacking.

12.3 Bioaccumulative potential

- Material data lacking.

12.4 Mobility in Soil

- Material data lacking.

12.5 Results of PBT and vPvB assessment

- No PBT and vPvB assessment has been conducted.

12.6 Other adverse effects

- No studies have been found.

Section 13 - Disposal Considerations

13.1 Waste treatment methods

Product waste

- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Packaging waste

- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Section 14 - Transport Information

<table>
<thead>
<tr>
<th>14.1 UN number</th>
<th>14.2 UN proper shipping name</th>
<th>14.3 Transport hazard class(es)</th>
<th>14.4 Packing group</th>
<th>14.5 Environmental hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOT</td>
<td>NDA</td>
<td>NDA</td>
<td>NDA</td>
<td>NDA</td>
</tr>
<tr>
<td>TDG</td>
<td>NDA</td>
<td>NDA</td>
<td>NDA</td>
<td>NDA</td>
</tr>
<tr>
<td>IMO/IMDG</td>
<td>NDA</td>
<td>NDA</td>
<td>NDA</td>
<td>NDA</td>
</tr>
<tr>
<td>IATA/ICAO</td>
<td>NDA</td>
<td>NDA</td>
<td>NDA</td>
<td>NDA</td>
</tr>
</tbody>
</table>

14.6 Special precautions for user

- None specified.

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

- Data lacking.
Section 15 - Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

SARA Hazard Classifications  •  None

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS</th>
<th>PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum oxide</td>
<td>1344-28-1</td>
<td>Yes</td>
</tr>
<tr>
<td>Hafnium oxide</td>
<td>12055-23-1</td>
<td>No</td>
</tr>
<tr>
<td>Zirconium oxide</td>
<td>1314-23-4</td>
<td>No</td>
</tr>
</tbody>
</table>

Inventory

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS</th>
<th>Canada DSL</th>
<th>Canada NDSL</th>
<th>China</th>
<th>EU EINECS</th>
<th>EU ELNICS</th>
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<tbody>
<tr>
<td>Aluminum oxide</td>
<td>1344-28-1</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Hafnium oxide</td>
<td>12055-23-1</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Zirconium oxide</td>
<td>1314-23-4</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Inventory (Con’t.)

<table>
<thead>
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<th>Component</th>
<th>CAS</th>
<th>Korea KECL</th>
<th>TSCA</th>
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</thead>
<tbody>
<tr>
<td>Aluminum oxide</td>
<td>1344-28-1</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Hafnium oxide</td>
<td>12055-23-1</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Zirconium oxide</td>
<td>1314-23-4</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Canada

Labor

Canada - WHMIS - Classifications of Substances

• Hafnium oxide 12055-23-1 Not Listed
  • Aluminum oxide 1344-28-1 Uncontrolled product according to WHMIS classification criteria
  • Zirconium oxide 1314-23-4 Uncontrolled product according to WHMIS classification criteria

Canada - WHMIS - Ingredient Disclosure List

• Hafnium oxide 12055-23-1 Not Listed
• Aluminum oxide 1344-28-1 1 %
• Zirconium oxide 1314-23-4 Not Listed

Environment

Canada - CEPA - Priority Substances List

• Hafnium oxide 12055-23-1 Not Listed
• Aluminum oxide 1344-28-1 Not Listed
• Zirconium oxide 1314-23-4 Not Listed

China

Environment

China - Ozone Depleting Substances - First Schedule

• Hafnium oxide 12055-23-1 Not Listed
<table>
<thead>
<tr>
<th>Substance</th>
<th>Code</th>
<th>Class</th>
<th>Status</th>
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<tbody>
<tr>
<td>Aluminum oxide</td>
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<td>Not Listed</td>
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<tr>
<td>Zirconium oxide</td>
<td>1314-23-4</td>
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</table>

**China - Ozone Depleting Substances - Second Schedule**

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</thead>
<tbody>
<tr>
<td>Hafnium oxide</td>
<td>12055-23-1</td>
<td></td>
<td>Not Listed</td>
</tr>
<tr>
<td>Aluminum oxide</td>
<td>1344-28-1</td>
<td></td>
<td>Not Listed</td>
</tr>
<tr>
<td>Zirconium oxide</td>
<td>1314-23-4</td>
<td></td>
<td>Not Listed</td>
</tr>
</tbody>
</table>

**China - Ozone Depleting Substances - Third Schedule**

<table>
<thead>
<tr>
<th>Substance</th>
<th>Code</th>
<th>Class</th>
<th>Status</th>
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<tbody>
<tr>
<td>Hafnium oxide</td>
<td>12055-23-1</td>
<td></td>
<td>Not Listed</td>
</tr>
<tr>
<td>Aluminum oxide</td>
<td>1344-28-1</td>
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<tr>
<td>Zirconium oxide</td>
<td>1314-23-4</td>
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</table>

**Other**

**China - Annex I & II - Controlled Chemicals Lists**

<table>
<thead>
<tr>
<th>Substance</th>
<th>Code</th>
<th>Class</th>
<th>Status</th>
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</thead>
<tbody>
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<tr>
<td>Zirconium oxide</td>
<td>1314-23-4</td>
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**China - Dangerous Goods List**

<table>
<thead>
<tr>
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<th>Status</th>
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<tbody>
<tr>
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<td>Zirconium oxide</td>
<td>1314-23-4</td>
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**Germany**

**Labor**

**Germany - Immission Control - Qualifying Quantities for Major Accident Prevention**

<table>
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<tr>
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<th>Code</th>
<th>Class</th>
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<tbody>
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<td>Zirconium oxide</td>
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**Germany - Immission Control - Qualifying Quantities for Safety Reporting**

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<th>Code</th>
<th>Class</th>
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<tbody>
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<td>Zirconium oxide</td>
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**Germany - TRGS 505 - Specific Lead Regulations**

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<td>Zirconium oxide</td>
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**Germany - TRGS 511 - Specific Ammonium Nitrate Regulations**

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<td>Zirconium oxide</td>
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**Environment**

**Germany - TA Luft - Types and Classes**

<table>
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<th>Code</th>
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<th>Status</th>
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</thead>
<tbody>
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<tr>
<td>Zirconium oxide</td>
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</table>

**Germany - TA Luft - Emission Limits for Carcinogenic Substances**

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<th>Class</th>
<th>Status</th>
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<tbody>
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Preparation Date: 14/July/2015
Revision Date: 11/August/2016

Format: EU CLP/REACH Language: English (US)
WHMIS, UN GHS, EU CLP, OSHA HCS 2012
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<td>Zirconium oxide</td>
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<td>Not Listed</td>
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</table>

**Germany - TA Luft - Emission Limits for Fibers**

- Hafnium oxide: 12055-23 Not Listed
- Aluminum oxide: 1344-28 Not Listed
- Zirconium oxide: 1314-23 Not Listed

**Germany - TA Luft - Emission Limits for Inorganic Dusts**

- Hafnium oxide: 12055-23 Not Listed
- Aluminum oxide: 1344-28 Not Listed
- Zirconium oxide: 1314-23 Not Listed

**Germany - TA Luft - Emission Limits for Inorganic Gases**

- Hafnium oxide: 12055-23 Not Listed
- Aluminum oxide: 1344-28 Not Listed
- Zirconium oxide: 1314-23 Not Listed

**Germany - Water Classification (VwVwS) - Annex 1**

- Hafnium oxide: 12055-23 Not Listed
- Aluminum oxide: 1344-28 Not Listed
- Zirconium oxide: 1314-23 Not Listed

**Germany - Water Classification (VwVwS) - Annex 2 - Water Hazard Classes**

- Hafnium oxide: 12055-23 Not Listed
- Aluminum oxide: 1344-28 Not Listed
- Zirconium oxide: 1314-23 Not Listed

**Germany - Water Classification (VwVwS) - Annex 3**

- Hafnium oxide: 12055-23 Not Listed
- Aluminum oxide: 1344-28 Not Listed
- Zirconium oxide: 1314-23 Not Listed

**United States**

**Labor**

**U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals**

- Hafnium oxide: 12055-23 Not Listed
- Aluminum oxide: 1344-28 Not Listed
- Zirconium oxide: 1314-23 Not Listed

**U.S. - OSHA - Specifically Regulated Chemicals**

- Hafnium oxide: 12055-23 Not Listed
- Aluminum oxide: 1344-28 Not Listed
### Environment

**U.S. - CAA (Clean Air Act) - 1990 Hazardous Air Pollutants**
- Hafnium oxide  
  - Code: 12055-23-1  
  - Not Listed
- Aluminum oxide  
  - Code: 1344-28-1  
  - Not Listed
- Zirconium oxide  
  - Code: 1314-23-4  
  - Not Listed

**U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities**
- Hafnium oxide  
  - Code: 12055-23-1  
  - Not Listed
- Aluminum oxide  
  - Code: 1344-28-1  
  - Not Listed
- Zirconium oxide  
  - Code: 1314-23-4  
  - Not Listed

**U.S. - CERCLA/SARA - Radionuclides and Their Reportable Quantities**
- Hafnium oxide  
  - Code: 12055-23-1  
  - Not Listed
- Aluminum oxide  
  - Code: 1344-28-1  
  - Not Listed
- Zirconium oxide  
  - Code: 1314-23-4  
  - Not Listed

**U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances EPCRA RQs**
- Hafnium oxide  
  - Code: 12055-23-1  
  - Not Listed
- Aluminum oxide  
  - Code: 1344-28-1  
  - Not Listed
- Zirconium oxide  
  - Code: 1314-23-4  
  - Not Listed

**U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances TPQs**
- Hafnium oxide  
  - Code: 12055-23-1  
  - Not Listed
- Aluminum oxide  
  - Code: 1344-28-1  
  - Not Listed
- Zirconium oxide  
  - Code: 1314-23-4  
  - Not Listed

**U.S. - CERCLA/SARA - Section 313 - Emission Reporting**
- Hafnium oxide  
  - Code: 12055-23-1  
  - Not Listed
- Aluminum oxide  
  - Code: 1344-28-1  
  - Not Listed
- Zirconium oxide  
  - Code: 1314-23-4  
  - Not Listed

**U.S. - CERCLA/SARA - Section 313 - PBT Chemical Listing**
- Hafnium oxide  
  - Code: 12055-23-1  
  - Not Listed
- Aluminum oxide  
  - Code: 1344-28-1  
  - Not Listed
- Zirconium oxide  
  - Code: 1314-23-4  
  - Not Listed

### United States - California

**Environment**

**U.S. - California - Proposition 65 - Carcinogens List**
- Hafnium oxide  
  - Code: 12055-23-1  
  - Not Listed
- Aluminum oxide  
  - Code: 1344-28-1  
  - Not Listed
- Zirconium oxide  
  - Code: 1314-23-4  
  - Not Listed

**U.S. - California - Proposition 65 - Developmental Toxicity**
- Hafnium oxide  
  - Code: 12055-23-1  
  - Not Listed
- Aluminum oxide  
  - Code: 1344-28-1  
  - Not Listed
- Zirconium oxide  
  - Code: 1314-23-4  
  - Not Listed

**U.S. - California - Proposition 65 - Maximum Allowable Dose Levels (MADL)**
- Hafnium oxide  
  - Code: 12055-23-1  
  - Not Listed
- Aluminum oxide  
  - Code: 1344-28-1  
  - Not Listed
<table>
<thead>
<tr>
<th>Substance</th>
<th>Code</th>
<th>CAS</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Zirconium oxide</td>
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<tr>
<td>Zirconium oxide</td>
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</table>

### U.S. - California - Proposition 65 - No Significant Risk Levels (NSRL)

#### U.S. - California - Proposition 65 - Reproductive Toxicity - Female

- Hafnium oxide: 12055-23-1 Not Listed
- Aluminum oxide: 1344-28-1 Not Listed
- Zirconium oxide: 1314-23-4 Not Listed

#### U.S. - California - Proposition 65 - Reproductive Toxicity - Male

- Hafnium oxide: 12055-23-1 Not Listed
- Aluminum oxide: 1344-28-1 Not Listed
- Zirconium oxide: 1314-23-4 Not Listed

### United States - Pennsylvania

#### Labor

- U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
  - Hafnium oxide: 12055-23-1 Not Listed
  - Aluminum oxide: 1344-28-1 Not Listed
  - Zirconium oxide: 1314-23-4 Not Listed

- U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances
  - Hafnium oxide: 12055-23-1 Not Listed
  - Aluminum oxide: 1344-28-1 Not Listed
  - Zirconium oxide: 1314-23-4 Not Listed

### 15.2 Chemical Safety Assessment

- No Chemical Safety Assessment has been carried out.

### Section 16 - Other Information

- **Last Revision Date**: 14/July/2015
- **Preparation Date**: 11/August/2016
- **Disclaimer/Statement of Liability**: Reasonable care has been taken in the preparation of this information, but the supplier gives no warranty of merchantability or of fitness for a particular purpose. Any product purchased is sold on the assumption the purchaser will make his own tests to determine the quality and suitability of the product. Supplier expressly disclaims any and all liability for incidental and/or consequential property damage arising out of the use of this product. No information provided shall be deemed to be a recommendation to use any product in conflict with any existing patent rights. Read the Safety Data Sheet before handling product.

**Key to abbreviations**

NDA = No data available