MATERIAL SAFETY DATA SHEET

SECTION 1 - IDENTIFICATION

Jensen Zirconia Materials

Product Names(S): Jensen Zirconia Blanks (ECO, HT, XT, and Imagine)  
Product Use: Zirconia blanks for milling

Importer/Supplier: Jensen Industries, Inc.  
50 Stillman Road  
North Haven, CT, 06473  
Emergency Telephone: 1-800-243-2000  
Revised: 12/23/14

SECTION 2 - HAZARD IDENTIFICATION

The hazards listed below may occur if the PELs and/or TLVs exceed the constituent’s established values listed in section 3:

Aluminum Oxide: Pneumoconiosis; lower respiratory irritation; neurotoxicity.

Hafnium Oxide: Upper respiratory irritation, irritation to skin & mucous membrane; possible liver damage.

Yttrium Oxide: Pulmonary fibrosis (Scarring of the lungs); eye irritation; possible liver damage.

Zirconium Oxide: Lung granulomas (Nodules caused by inflammation); irritation to skin & mucous membrane.

SECTION 3 – COMPOSITION / INFORMATION ON HAZARDOUS INGREDIENTS

<table>
<thead>
<tr>
<th></th>
<th>ZrO₂ (Zirconium Oxide)%</th>
<th>Y₂O₃ (Yttrium Oxide)%</th>
<th>HfO₂ (Hafnium Oxide)%</th>
<th>Al₂O₃ (Aluminum Oxide)%</th>
<th>Organic Binder %</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS#</td>
<td>1314-23-4</td>
<td>1314-36-9</td>
<td>12055-23-1</td>
<td>1344-28-1</td>
<td>N/A</td>
</tr>
<tr>
<td>*PEL/OSHA (mg/m³)</td>
<td>5</td>
<td>1</td>
<td>0.5</td>
<td>15/5R</td>
<td>N/A</td>
</tr>
<tr>
<td>**TLV/ACGIH (mg/m³)</td>
<td>5/10 STEL</td>
<td>1</td>
<td>0.5</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td>ECO</td>
<td>94-100</td>
<td>5-6</td>
<td>0-5</td>
<td>&lt;1</td>
<td>¹Balance</td>
</tr>
<tr>
<td>HT</td>
<td>80-100</td>
<td>0-6</td>
<td>0-5</td>
<td>0-1</td>
<td>²Balance</td>
</tr>
<tr>
<td>Imagine</td>
<td>80-100</td>
<td>&lt;10</td>
<td>&lt;5</td>
<td>&lt;1</td>
<td>²Balance</td>
</tr>
<tr>
<td>XT</td>
<td>92-96</td>
<td>4-6</td>
<td>2-4</td>
<td>0-1</td>
<td>²Balance</td>
</tr>
</tbody>
</table>

*Taken from the Permissible Exposure Limits for Air Contaminants established by OSHA CFR 29 1910.1000 Subpart Z – Toxic and Hazardous Substances

**Taken from the ACGIH Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices

¹Balance = The majority of the organic binder is eliminated during the Zr blank processing.

R = Respirable Particulate Mass TLVs® (RPM-TLVs) for those materials that are hazardous when deposited in the gas-exchange region

STEL: (Short Term Exposure Limit) A 15 minute TWA (Time Weighted Average) exposure that should not be exceeded at any time during a workday even if the 8-hour TWA is within the TLV-TWA.
SECTION 4 - FIRST AID MEASURES

Inhalation: Breathing difficulty caused by inhalation of dust or fume requires immediate removal to fresh air. If breathing has stopped, perform artificial respiration and obtain medical assistance.

Ingestion: Swallowing this material can be treated by having the affected person drink 1 to 2 glasses of water. If this method proves ineffective, immediately obtain medical assistance. Do not induce vomiting.

Skin: Wash with plenty of soap and water. Obtain medical help if irritation develops and persists, or if visual changes occur.

Eyes: Rinse Dust or powder should from the eyes with a lot of clean water. Obtain medical help if irritation persists.

SECTION 5 - FIRE FIGHTING MEASURES

Flash Point: N/A          Explosive Limits: N/A

Extinguishing Media: Use fire fighting measures that suit the environment: Dry chemical, foam, CO₂, or water.

Fire & Explosion Hazards: Fire can cause release of nitrogen oxides (NOx) and ammonia (NH₃). Metal oxide fumes may result from intense heating

Special Fire Fighting Procedures: This material becomes airborne as a respirable particulate during a fire situation, pressure-demand self-contained breathing apparatus must be worn by firefighters or any other persons potentially exposed to the airborne dust.

Unusual Fire and Explosion Hazards: The powder is essentially inert. However, dusts, when mixed with air in critical proportions, and in the presence of an ignition source, may present an explosion hazard.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Steps to Be Taken If Material Is Released or Spilled: Wear adequate respiratory protection for the severity of the spill. Cleanup should be conducted with a vacuum system utilizing a high efficiency particulate air (HEPA) filtration system followed by wet cleaning methods. Special precautions must be taken when changing filters on HEPA vacuum cleaners used to clean up potentially toxic materials. Caution should be taken to minimize airborne generation of powder or dust. Do not flush to drain. Spills may be reportable to the National Response Center (800-424-8802), and to other state and/or local agencies.

SECTION 7 - HANDLING AND STORAGE

Handling: None, if used properly; avoid the creation of dust from this product

Storage: No special storage requirements required.

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Ventilation and Engineering Controls: Always use the vacuum system with the mill when cutting the zirconia block. When cleaning the mill, and/or if the vacuum system is found not to be functioning, use a respirator (see below). Ventilation equipment should be checked regularly to ensure it is functioning properly.

Respiratory Protection: When potential exposures are above the occupational limits shown in Section 3, or are unknown, NIOSH/MSHA approved respirators must be used as specified by an Industrial Hygienist or other qualified professional. Respirator users must be medically evaluated to determine if they are physically capable of wearing a respirator. Quantitative and/or qualitative fit testing and respirator training must be satisfactorily completed by all personnel prior to respirator use. Users of any style respirator must be clean- on those areas of the face where the respirator seal contacts the face. Respirators should be used when cleaning the mill, or performing any other maintenance to the mill, where powder/dust will be airborne.

Work Practice Controls: Do not store, use, and/or consume foods, beverages, tobacco products, or cosmetics in areas when handling this material.
**Other Protective Equipment:** Long sleeved clothing recommended when dust/powder can potentially contact skin.

**Gloves:** Rubber or latex gloves recommended when dust/powder can potentially contact skin.

**Eye Protection:** Safety glasses (goggles) recommended when dust/powder can potentially contact eyes.

**Recommended Monitoring Procedures:**

**Environmental Surveillance:** Exposure to airborne materials should be determined by having air samples taken in the employee breathing zone, work area, and department. The frequency and type of air sampling should be as specified by an Industrial Hygienist or other qualified professional. Air sample results should be made available to employees.

**Medical Surveillance:** Persons exposed to airborne concentrations of this material should be included in a periodic medical surveillance program. The program should include examination of the skin and respiratory system. Non-specific findings of skin rash, skin granulomata, or respiratory signs or symptoms may indicate a reaction to this material.

### SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>White</td>
</tr>
<tr>
<td>Melting Point (°C)</td>
<td>~2680</td>
</tr>
<tr>
<td>Density (g/cm³)</td>
<td>3.0 to 6.0</td>
</tr>
<tr>
<td>Boiling Point (°C)</td>
<td>~4300</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>N/A</td>
</tr>
<tr>
<td>Melting Point (°C)</td>
<td>~2680</td>
</tr>
<tr>
<td>Freezing Point</td>
<td>N/A</td>
</tr>
<tr>
<td>Odor</td>
<td>none</td>
</tr>
<tr>
<td>pH-value</td>
<td>N/A</td>
</tr>
<tr>
<td>Physical State</td>
<td>Solid block</td>
</tr>
<tr>
<td>Radioactivity</td>
<td>N/A</td>
</tr>
<tr>
<td>Solubility</td>
<td>insoluble in water</td>
</tr>
<tr>
<td>Sublimes At</td>
<td>N/A</td>
</tr>
<tr>
<td>Vapor Density (Air = 1)</td>
<td>N/A</td>
</tr>
<tr>
<td>Vapor Pressure (mmHg)</td>
<td>N/A</td>
</tr>
<tr>
<td>% Volatiles by Volume</td>
<td>none</td>
</tr>
</tbody>
</table>

### SECTION 10 - STABILITY AND REACTIVITY

**General Reactivity:** This material is stable. **Non-compatibility With Other Substances:** None known.

**Hazardous Combustion Products:** None under normal conditions of use. **Hazardous Polymerization:** Will not occur.

**Conditions to be Avoided:** Extreme heat, open flame, dusting conditions.

### SECTION 11 - TOXICOLOGICAL INFORMATION

**PRIMARY ROUTES OF EXPOSURE:**

**Inhalation:** Dust is generated when milling the product. Lung irritation and/or pulmonary fibrosis are the principal conditions that can result from inhalation.

The potential for exposures may also occur during repair or maintenance activities on contaminated equipment.

**Ingestion:** Ingestion can occur from dust or powder contamination involved with hand to mouth activities such as eating, drinking, smoking, nail biting, etc. These products are not intended for internal consumption. As a standard hygiene practice, hands should be washed before eating or smoking.

**Skin:** Skin contact with this material may cause dermatitis/irritation. Also refer to Section 4 for additional information.

**Eyes:** Injury can result from particulate irritation or mechanical injury to the eyes by dust or particulate. Exposure may result from direct contact with airborne particulate (dust or powder) or contact to the eye of contaminated hands or clothing.

**EFFECTS OF OVEREXPOSURE:**

The potential health effects listed below are confined to constituents which are in sufficient concentrations within the product to be significant.

**Acute (immediate or near-term health effects):** In general, the airborne dust/fumes from the zirconia block may cause irritation to the skin, eyes, nose, throat, lungs, and mucous membranes.

**Acute Oral Toxicity:** LDLo > 10kg/kg, rat; (Data for yttrium oxide. LDLo = lowest lethal dose)
Chronic (long-term health effects): In general, the airborne dust/powder of the zirconia block constituents, listed in Section 2 can cause respiratory disease with symptoms which include cough, chest pain, shortness of breath, weight loss, weakness, and fatigue. Exposure to airborne dust and powder may cause long-term health effects including loss of lung function, fibrosis, Cough, dyspnea (breathing difficulty), wheezing; decreased pulmonary function, progressive respiratory symptoms (silicosis); irritation eyes; [potential occupational carcinogen], and liver damage.

CARCINOGENIC REFERENCES:
  NTP: None
  IARC: None
  NIOSH: None
  ACGIH: Aluminum Oxide is listed as an A4, not classifiable as a human carcinogen.
  Zirconium Oxide is listed as an A4, not classifiable as a human carcinogen.

Medical Conditions Aggravated By Exposure: Persons with impaired pulmonary function, airway diseases, or conditions such as asthma, emphysema, chronic bronchitis, etc. may incur further impairment if dust or fume is inhaled.

SECTION 12- ECOLOGICAL INFORMATION
This material is insoluble in water. There is no information available on the ecological effects of this material.

SECTION 13- DISPOSAL CONSIDERATIONS
Waste Management: Material and/or packaging, containing powder, should be sealed inside a plastic bag when disposed of. Avoid washing down drains as material can plug drain. Comply with Federal, State, and local regulations.

SECTION 14 - TRANSPORT INFORMATION
There are no U.S. Department of Transportation hazardous material regulations that apply to the packaging and labeling of this product as shipped by Jensen Industries Inc.

SECTION 15- REGULATORY INFORMATION
OSHA Hazard Communication Standard, 29 CFR 1910.1200: Components of these products are considered hazardous ingredients.

Wastewater: Wastewater regulations can vary considerably. Contact your local and state governments to determine their requirements.

SARA Title III Hazard Classes:
  Fire Hazard: No
  Reactive Hazard: No
  Release of Pressure: No
  Acute Health Hazard: Yes
  Chronic Health Hazard: No

SARA Extremely Hazardous Substances/CERCLA Hazardous substances: None
TSCA 8(b) Inventory: Zirconium oxide
California Proposition 65: This product does not contain any components that are regulated under Proposition 65.

SECTION 16 - OTHER INFORMATION
This data is based on our present knowledge. However, that shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship. This MSDS has been revised following the guidelines outlined in CFR 1910-1200 “Material Safety Data Sheets.”
Important: If you have any questions or require additional information regarding the materials described in this Material Safety Data Sheet please contact Jensen Industries Inc. at 1-(800) 243-2000.