SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

GHS Product Identifier: Milled Baddeleyite
Chemical Name: (mixture) Baddeleyite
Recommended Applications: Used singularly or as a component in refractories, investment casting and high temperature coatings.

Manufacturer Information: TAM Ceramics, LLC (#220821)
4511 Hyde Park Blvd Niagara Falls, NY 14305
Phone Number: 716-278-9400
Website: www.tamceramics.com

CHEMICAL EMERGENCY CHEMTREC 24 HOUR EMERGENCY TELEPHONE
Spill, Leak, Fire, Exposure or Accident
DOMESTIC NORTH AMERICA 800-424-9300
INTERNATIONAL CALL: 703-527-3887
Collect Calls Accepted

SECTION 2. HAZARD(S) IDENTIFICATION

GHS Pictogram:

Signal word: WARNING

GHS classification:
- Eye irritation, Category 2
- Skin irritation, Category 2

Hazard Statement:
- Inert particles can be slightly, mechanically irritating to the eyes.
- Prolonged skin contact may cause skin irritation or dermatitis.
- Overexposure by inhalation may cause respiratory irritation.

Precautionary Statement:
- Wash hands thoroughly after handling. Minimize exposure by wearing protective gloves, clothing, eye protection and respiratory masks. Have a clean change of works clothes readily available. Avoid dust formation and utilize good housekeeping practices.

Route of Exposure: Eyes, skin, inhalation and ingestion.

Potential Health Effects:

Eye:
- May cause a slight irritation. Resin particles, like other inert materials, are mechanically irritating to eyes.

Skin:
- Prolonged skin contact may cause skin irritation and/or dermatitis.

Inhalation:
- Product dust may be irritating to eyes, skin and respiratory system. Over-exposure by inhalation may cause respiratory irritation.

Ingestion:
- May irritate digestive tract if swallowed.

Chronic toxicity:
- Excessive inhalation of dust may cause chemical pneumonitis, cyanosis, and pulmonary edema. This product contains amorphous silica. Overexposure by inhalation of respirable dust may cause respiratory problems including pneumoconiosis. This product contains trace quantities (130 to 145 pCi/g) of naturally occurring Uranium and Thorium. Overexposure by inhalation of respirable dust containing these radioactive elements may cause lung cancer. This product contains zirconium dioxide and it has been reported to cause lung granulomas.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No</th>
<th>EC Number</th>
<th>Weight %</th>
<th>OSHA</th>
<th>ACGIH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zirconium dioxide</td>
<td>1314-23-4</td>
<td>215-227-2</td>
<td>95 - 99%</td>
<td>5 mg/m³ TWA as Zr</td>
<td>10 mg/m³ STEL as Zr 5 mg/m³ TWA as Zr</td>
</tr>
<tr>
<td>Calcium Oxide</td>
<td>1305-78-8</td>
<td>215-138-9</td>
<td>0.1 - 0.5%</td>
<td>5 mg/m³ TWA</td>
<td>2 mg/m³ TWA</td>
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<tr>
<td>Rutile</td>
<td>131 7-80-2</td>
<td>215-282-2</td>
<td>0.1 - 0.5%</td>
<td>Not established</td>
<td>Not established</td>
</tr>
<tr>
<td>Aluminium oxide</td>
<td>1344-28-1</td>
<td>215-696-6</td>
<td>0.1 - 0.5%</td>
<td>15 mg/m³ TWA 5 mg/m³ TWA</td>
<td>10 mg/m³ TWA</td>
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<tr>
<td>Ferrous oxide</td>
<td>1345-25-1</td>
<td>215-721-8</td>
<td>0.1 - 0.5%</td>
<td>Not established</td>
<td>1 mg/m³ TWA (as Fe)</td>
</tr>
<tr>
<td>Quartz silica</td>
<td>14808-60-7</td>
<td>238-878-4</td>
<td>0.1 - 0.5%</td>
<td>30 mg/m³ / (%SiO₂ +2)</td>
<td>0.05 mg/m³ TWA</td>
</tr>
</tbody>
</table>

Total Dust: 10 mg/m³ / (%SiO₂ +2) Respirable

SECTION 4. FIRST AID MEASURES

Eye contact: Rinse eyes immediately with plenty of water on eye surfaces and under eyelids. Get medical attention if irritation develops.

Skin contact: Wash off immediately with soap and plenty of water. Remove and wash contaminated clothing before re-use. If symptoms persist, call a physician.

Inhalation: Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. If symptoms persist, call a physician.

Ingestion: Drink plenty of water. Consult a physician if necessary. Do not induce vomiting without medical advice.

Notes to physician: Treat symptomatically.
**SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>White to light yellow</td>
</tr>
<tr>
<td>Odor</td>
<td>Odorless</td>
</tr>
<tr>
<td>Boiling point/Range (°C)</td>
<td>No data available</td>
</tr>
<tr>
<td>Melting point/Range (°C)</td>
<td>2715</td>
</tr>
<tr>
<td>Vapor pressure (mmHg)</td>
<td>No data available</td>
</tr>
<tr>
<td>Water solubility (mg/l)</td>
<td>Insoluble</td>
</tr>
<tr>
<td>Physical state</td>
<td>Powder or Grain</td>
</tr>
<tr>
<td>Molecular weight</td>
<td>No data available</td>
</tr>
<tr>
<td>pH</td>
<td>No data available</td>
</tr>
<tr>
<td>Specific gravity (Water =1)</td>
<td>5.600 - 5.900</td>
</tr>
<tr>
<td>Evaporation rate (Water =1)</td>
<td>No data available</td>
</tr>
<tr>
<td>VOC content (%)</td>
<td>No data available</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>No Data Available</td>
</tr>
<tr>
<td>Flash point</td>
<td>No Data Available</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>No Data Available</td>
</tr>
<tr>
<td>Upper/lower flammability or explosive limits</td>
<td>No Data Available</td>
</tr>
<tr>
<td>Vapor density</td>
<td>No Data Available</td>
</tr>
<tr>
<td>Relative density</td>
<td>No Data Available</td>
</tr>
<tr>
<td>Partition coefficient</td>
<td>n-octanol/water: No Data Available</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No Data Available</td>
</tr>
<tr>
<td>Viscosity</td>
<td>No Data Available</td>
</tr>
</tbody>
</table>

**SECTION 10. STABILITY AND REACTIVITY**

- **Stability:** Stable at normal conditions.
- **Polymerization:** Will not occur.
- **Hazardous decomposition products:** None under normal use.
- **Conditions to avoid:** Avoid dust formation.

**SECTION 11. TOXICOLOGICAL INFORMATION**

- **Acute Toxicity:** Contains crystalline silica which causes silicosis and lung cancer.
- **Chronic toxicity:** Not listed by IARC, NTP or OSHA as a carcinogen.
- **Carcinogenic effects:** Silica: Respiratory system. Zirconium: Skin, respiratory system.
- **Target Organ Effects:**
  - ACGIH - Carcinogens: A4 - Not Classifiable as a Human Carcinogen
  - A4 - Not Classifiable as a Human Carcinogen (as Zr)
- **Zirconium Dioxide**
  - ACGIH - Carcinogens: A4 - Not Classifiable as a Human Carcinogen
  - A4 - Not Classifiable as a Human Carcinogen
- **Aluminum Oxide**
  - ACGIH - Carcinogens: A4 - Not Classifiable as a Human Carcinogen
- **Ferrous Oxide**
  - NIOSH - LD50s and LC50s: = 30 g/kg Oral LD50 Rat
- **Quartz Silica**
  - ACGIH - Carcinogens: A2 - Suspected Human Carcinogen
  - NTP: Known Carcinogen
  - IARC - Group 1: Monograph 68, 1997
  - Monograph 68, 1997 (inhaled in the form of quartz or cristobalite from occupational sources)

**SECTION 12. ECOLOGICAL INFORMATION**

- **Aquatic toxicity:** No information available
- **Persistence and degradability:** No information available

**SECTION 13. DISPOSAL CONSIDERATIONS**

- **Waste from residues / unused products:** Waste must be disposed of in accordance with federal, state and local environmental control regulations. Where possible recycling is preferred to disposal or incineration. This product contains Naturally Occurring Radioactive Materials (NORM). Consult and comply with current regulations.
DOT:
Proper shipping name: Not regulated.

TDG (Canada):
Proper shipping name: Not regulated.

U.S. Regulations:
Not subject to the provisions of SARA 313 Title III
Not subject to TSCA 12(b) Export Notification

State Regulations
This product or its ingredients have been evaluated for New Jersey, Pennsylvania, and California Prop 65 supplier notification requirements. Substances that are subject to notification requirements, if any, are listed below.

Zirconium Dioxide
NJRTK: sn 2047
PARTK: Listed
Cal Prop65: Radionuclides
Quartz Silica
NJRTK: sn 1660
PARTK: Listed
Cal Prop65: carcinogen, initial date 10/1/88 (airborne particles of respirable size)

Canadian WHMIS
WHMIS hazard class: D2A Very toxic materials, D2B Toxic materials.

International Inventories
TSCA 8(b): All the ingredients are on the TSCA list.
Canadian DSL: All the ingredients are on the DSL
EINECS: All the ingredients are on the EINECS list.
Philippines (PICCS): Listed.
Japan (ENCS): Listed.
Korea (KECL): Listed.
China (IECS): Listed.
Australia (AICS): Listed.

For Industrial Use Only

National Fire Protection Association (U.S.A.):
Health: 1
Fire: 0
Physical Hazard: 0
PPE: X

Prepared by: Product Manufacturer, TAM Ceramics Group of NY, LLC

Protective Equipment: Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

The information and recommendations contained in this Safety Data Sheet have been compiled from sources believed to be reliable and to represent the most reasonable current opinion on the subject when the SDS was prepared. No warranty, guaranty or representation is made as to the correctness or sufficiency of the information. The user of this product must decide what safety measures are necessary to safely use this product, either alone or in combination with other products, and determine its environmental regulatory compliance obligations under any applicable federal or state laws.

Last Updated: May 2015

End of Safety Data Sheet