Ceramic Components for Semiconductor Processing
DESIGN & SIMULATION TECHNOLOGY

- SUPER COMPUTER
  - Thermal conductivity analysis
  - Stress analysis
  - Fluid thermal analysis
  - Shock analysis
  - Electro magnetic field analysis
  - Piezo electric device vibration analysis
  - Electrical analysis

ANALYSIS TECHNOLOGY

- TEM
- XRD
- EPMA
- AFM

EVALUATION TECHNOLOGY

- Electrical evaluation
- Durability evaluation
- Mechanical evaluation
- Thermal friction evaluation
## Material Characteristics

<table>
<thead>
<tr>
<th>Item</th>
<th>Material</th>
<th>Unit</th>
<th>Measuring Method</th>
<th>Alumina (AI2O3)</th>
<th>Sapphire</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kyocera No.</strong></td>
<td>A-479</td>
<td>A-479S</td>
<td></td>
<td></td>
<td>SA-100</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>99% White</td>
<td>99.5% Ivory</td>
<td>99.5% Ivory</td>
<td>99.7% Ivory</td>
<td>99.9% Transparent</td>
</tr>
<tr>
<td><strong>Bulk Density</strong></td>
<td>JIS R1634</td>
<td>3.8</td>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
</tr>
<tr>
<td><strong>Water Absorption</strong></td>
<td>JIS R1634</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Vickers Hardness HV1 (Load=9.807N)</strong> (GPa)</td>
<td>JIS R1610</td>
<td>15.2</td>
<td>16.0</td>
<td>15.7</td>
<td>17.2</td>
</tr>
<tr>
<td><strong>Flexural Strength (3PB) R.T.</strong> (MPa)</td>
<td>JIS R1601</td>
<td>310</td>
<td>360</td>
<td>370</td>
<td>380</td>
</tr>
<tr>
<td><strong>Young's Modulus of Elasticity</strong> (GPa)</td>
<td>JIS R1602</td>
<td>380</td>
<td>370</td>
<td>380</td>
<td>380</td>
</tr>
<tr>
<td><strong>Poisson's Ratio</strong></td>
<td>JIS R1602</td>
<td>0.23</td>
<td>0.23</td>
<td>0.23</td>
<td>0.23</td>
</tr>
<tr>
<td><strong>Fracture Toughness (SEPB)</strong></td>
<td>JIS R1607</td>
<td>3 ~ 4</td>
<td>4</td>
<td>5 ~ 8</td>
<td></td>
</tr>
<tr>
<td><strong>Coefficient of Linear Thermal Expansion</strong> (JIS R1618)</td>
<td>40°C ~ 400°C</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
</tr>
<tr>
<td></td>
<td>40°C ~ 800°C</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
</tr>
<tr>
<td><strong>Thermal Conductivity 20°C</strong> (W/m.k)</td>
<td>JIS R1611</td>
<td>29</td>
<td>32</td>
<td>32</td>
<td>34</td>
</tr>
<tr>
<td><strong>Specific Heat</strong></td>
<td>JIS R1648</td>
<td>0.79</td>
<td>0.78</td>
<td>0.78</td>
<td>0.78</td>
</tr>
<tr>
<td><strong>Heat Shock Resistance</strong></td>
<td></td>
<td>C</td>
<td>200</td>
<td>250</td>
<td>-</td>
</tr>
<tr>
<td><strong>Dielectric Strength</strong></td>
<td>JIS C2141</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td><strong>Volume Resistivity</strong></td>
<td>JIS C2141</td>
<td>&gt;10¹⁰</td>
<td>&gt;10¹⁰</td>
<td>&gt;10¹⁰</td>
<td>&gt;10¹⁰</td>
</tr>
<tr>
<td><strong>Dielectric Constant (1MHz)</strong></td>
<td>JIS R1602</td>
<td>9.9</td>
<td>9.9</td>
<td>9.9</td>
<td>9.9</td>
</tr>
<tr>
<td><strong>Dielectric Loss Angle (1MHz)</strong></td>
<td>(X10⁴)</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>&lt;1</td>
</tr>
<tr>
<td><strong>Loss Factor</strong></td>
<td>(X10⁴)</td>
<td>0.10</td>
<td>0.05</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td><strong>Nitric Acid(60%)</strong></td>
<td>JIS R1614</td>
<td>0.33</td>
<td>0.25</td>
<td>0.22</td>
<td>0.19</td>
</tr>
<tr>
<td><strong>Sulphuric Acid(95%)</strong></td>
<td>JIS R1614</td>
<td>0.19</td>
<td>0.35</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Caustic Soda(90%)</strong></td>
<td>JIS R1614</td>
<td>0.26</td>
<td>0.05</td>
<td>-</td>
<td>0.03</td>
</tr>
</tbody>
</table>

### Unit Conversion Table

**Stress**

<table>
<thead>
<tr>
<th>Mpa</th>
<th>Kg/mm²</th>
<th>Kg/cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9.807</td>
<td>9.807</td>
</tr>
<tr>
<td>1.516</td>
<td>1.516</td>
<td>1.516</td>
</tr>
<tr>
<td>2.388</td>
<td>2.388</td>
<td>2.388</td>
</tr>
</tbody>
</table>

**Thermal Conductivity**

<table>
<thead>
<tr>
<th>W/(m·k)</th>
<th>Cal/cm·Sec·°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.163</td>
</tr>
<tr>
<td>1</td>
<td>2.78×10⁻¹⁰</td>
</tr>
</tbody>
</table>

**Notes**

- These values are only for reference, showing the measurement results of test pieces specified.
- The values may change dependent on the using conditions and the shape of products.
- For more details, please feel free to contact us.
Alumina Wafer Polishing Plate / Turn Table
- Material: Al₂O₃
- Size: Up to 39" in diameter
- Features:
  - High rigidity
  - High chemical durability
  - Surface shape & roughness control

Silicon Carbide Wafer Polishing Plate
- Material: SiC
- Size: Up to 30" in diameter
- Features:
  - High thermal conductivity
  - Low thermal expansion
  - High rigidity

Pad Dresser
- Material: Al₂O₃, SiC, Si₃N₄
- Features:
  - High wear resistance
  - Square bumps / pyramid bumps

Sapphire Carrier Plate
- Material: Sapphire
- Size: Up to 8" in diameter
- Features:
  - High purity
  - High chemical durability
  - No grain boundary
  - Transparent
**Plasma Proof Dome**
- **Material**: Al₂O₃
- **Size**: For 200mm / 300mm equipment
- **Features**:
  - High purity
  - High plasma durability

**Plasma Proof Ring**
- **Material**: Al₂O₃, Y₂O₃
- **Size**: For 200mm / 300mm equipment
- **Features**:
  - High purity
  - High plasma durability

**Electro-Static Chuck**
- **Material**: Al₂O₃, AlN, Sapphire
- **Size**: For 200mm / 300mm equipment
- **Features**:
  - High purity
  - High plasma durability
  - Good chucking / de-chucking response
  - High temp. and low temp. application

**Heater**
- **Material**: AlN
- **Size**: For 200mm / 300mm equipment
- **Features**:
  - High purity
  - High plasma durability
  - Uniform thermal distribution
**Vacuum Chuck**

- **Material**: Al$_2$O$_3$, Porous Al$_2$O$_3$, SiC
- **Size**: For 200mm / 300mm equipment
- **Features**:
  - High purity
  - High chemical durability
  - Vacuum channel inside
  - Variety surface shape

**Nozzle**

- **Material**: Al$_2$O$_3$
- **Size**: Nozzle diameter +/-5 μm
- **Features**:
  - High plasma durability
  - Gas flow rate control

**End Effector**

- **Material**: Al$_2$O$_3$, SiC, Sapphire
- **Size**: For 200mm / 300mm equipment
- **Features**:
  - High purity
  - Vacuum channel inside
  - SiC coating
  - Mirror polished surface

**Chamber Window & Tube**

- **Material**: Sapphire
- **Features**:
  - High purity
  - High plasma durability
  - Transparent
  - High transmission factor
### EPOCH-MAKING TECHNOLOGIES

#### USM Stage - Assembly Technology
- **Material**: Al₂O₃, Al
- **Features**:
  - Ultrasonic Motor drive
  - High positioning accuracy
  - Compact design

#### Metalized Products - Metal Assembly Technology
- **Material**: Al₂O₃, Al, Stainless steel, etc.
- **Application**:
  - IC Packages
  - High vacuum component
  - High voltage terminal, etc.

#### Coating Technology
- **Material**: SiC, DLC, etc.
- **Features**:
  - Discharge of static electricity
  - Soft contact

#### Large Size Product Manufacturing Technology
- **Material**: Al₂O₃, Y₂O₃, SiC, Si₃N₄
- **Application**:
  - LCD manufacturing equipment
  - Lithography equipment

#### Material Development Technology
- **Material**: Low thermal expansion materials
- **Application**:
  - Lithography equipment
  - Wafer Inspection equipment
The contents of this catalog are subject to change without prior notice for further improvement. Application and usage conditions should be consulted upon when considering purchase.