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 (SiO₂)</th>
<th>Silicon Carbide (SiC)</th>
<th>Silicon Nitride (Si₃N₄)</th>
<th>Ceramic (3mol%Y₂O₃/2mol%ZrO₂)</th>
<th>Cordierite (2mol%MgO·5mol%Al₂O₃)</th>
<th>Yttria (Y₂O₃)</th>
<th>Zirconia (ZrO₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td></td>
<td></td>
<td></td>
<td>99% White</td>
<td>99.5% Ivory</td>
<td>99.5% Ivory</td>
<td>99.7% Ivory</td>
<td>99.9% Ivory</td>
<td>99.9% Transparent</td>
<td></td>
</tr>
<tr>
<td>Bulk Density</td>
<td></td>
<td>g/cm³</td>
<td>JIS R1634</td>
<td>3.8</td>
<td>3.9</td>
<td>3.9</td>
<td>3.6</td>
<td>3.9</td>
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<tr>
<td>Water Absorption</td>
<td></td>
<td>%</td>
<td>JIS R1634</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Vickers Hardness HVI (Load=9.807N)</td>
<td></td>
<td>(GPa)</td>
<td>JIS R1610</td>
<td>15.2</td>
<td>16.0</td>
<td>15.7</td>
<td>17.2</td>
<td>17.5</td>
<td>22.5</td>
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<tr>
<td>Flexural Strength (3PB) R.T.</td>
<td></td>
<td>(MPa)</td>
<td>JIS R1601</td>
<td>310</td>
<td>360</td>
<td>370</td>
<td>380</td>
<td>400</td>
<td>690</td>
<td></td>
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<tr>
<td>Young’s Modulus of Elasticity</td>
<td></td>
<td>(GPa)</td>
<td>JIS R1602</td>
<td>360</td>
<td>370</td>
<td>370</td>
<td>380</td>
<td>380</td>
<td>470</td>
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<tr>
<td>Poisson’s Ratio</td>
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<td>0.23</td>
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<td>0.23</td>
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<tr>
<td>Fracture Toughness (SEPB)</td>
<td></td>
<td>MPam²</td>
<td>JIS R1607</td>
<td>3 ~ 4</td>
<td>4</td>
<td>4</td>
<td>5 ~ 8</td>
<td>5 ~ 8</td>
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<tr>
<td>Coefficient of Linear Thermal Expansion</td>
<td></td>
<td>x10⁴/°C</td>
<td>JIS R1618</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
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<tr>
<td>Thermal Conductivity 20°C</td>
<td></td>
<td>W/(m·K)</td>
<td>JIS R1611</td>
<td>29</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>34</td>
<td>41</td>
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<td>Specific Heat</td>
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<td></td>
<td>JIS R1611</td>
<td>0.79</td>
<td>0.78</td>
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<tr>
<td>Heat Shock Resistance</td>
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<td>C</td>
<td>JIS R1648</td>
<td>200</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
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<tr>
<td>Dielectric Strength</td>
<td></td>
<td>KV/mm</td>
<td>JIS R1634</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>48</td>
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<tr>
<td>Volume Resistivity</td>
<td></td>
<td>O·cm</td>
<td>JIS C2141</td>
<td>&gt;10⁴</td>
<td>&gt;10⁴</td>
<td>&gt;10⁴</td>
<td>&gt;10⁴</td>
<td>&gt;10⁴</td>
<td>&gt;10⁴</td>
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<tr>
<td>Dielectric Constant (1MHz)</td>
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<td></td>
<td></td>
<td>10²</td>
<td>10¹²</td>
<td>10¹²</td>
<td>10¹²</td>
<td>10¹²</td>
<td>10¹²</td>
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<tr>
<td>Dielectric Loss Angle (1MHz)</td>
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<td></td>
<td></td>
<td>0.01</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
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<tr>
<td>Loss Factor</td>
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<td></td>
<td></td>
<td>2.1</td>
<td>1.1</td>
<td>1.1</td>
<td>&lt;1</td>
<td>&lt;1</td>
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<td></td>
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<tr>
<td>Nitric Acid(60%)90°C</td>
<td></td>
<td>mg/cm³</td>
<td>JIS R1634</td>
<td>5.1</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
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<tr>
<td>Sulphuric Acid(95%)95°C</td>
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<td></td>
<td></td>
<td>0.26</td>
<td>0.05</td>
<td>0.04</td>
<td>0.03</td>
<td>0.03</td>
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<tr>
<td>Caustic Soda(30%)80°C</td>
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<td></td>
<td></td>
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</tbody>
</table>

### Unit Conversion Table

#### Stress

<table>
<thead>
<tr>
<th>Stress</th>
<th>Unit Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mpa</td>
<td>Kgf/mm²</td>
</tr>
<tr>
<td>1</td>
<td>1.0197 × 10⁴</td>
</tr>
<tr>
<td>9.807</td>
<td>1 × 10⁶</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>0.239 × 10⁶</td>
</tr>
<tr>
<td>1.163</td>
<td>2.78 × 10⁷</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
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- Material: Sapphire
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  - 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

<table>
<thead>
<tr>
<th>Material</th>
<th>Al$_2$O$_3$, Porous Al$_2$O$_3$, SiC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>For 200mm / 300mm equipment</td>
</tr>
<tr>
<td>Features</td>
<td>High purity</td>
</tr>
<tr>
<td></td>
<td>High chemical durability</td>
</tr>
<tr>
<td></td>
<td>Vacuum channel inside</td>
</tr>
<tr>
<td></td>
<td>Variety surface shape</td>
</tr>
</tbody>
</table>

### Nozzle

<table>
<thead>
<tr>
<th>Material</th>
<th>Al$_2$O$_3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>Nozzle diameter +/-5μm</td>
</tr>
<tr>
<td>Features</td>
<td>High plasma durability</td>
</tr>
<tr>
<td></td>
<td>Gas flow rate control</td>
</tr>
</tbody>
</table>

### End Effector

<table>
<thead>
<tr>
<th>Material</th>
<th>Al$_2$O$_3$, SiC, Sapphire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>For 200mm / 300mm equipment</td>
</tr>
<tr>
<td>Features</td>
<td>High purity</td>
</tr>
<tr>
<td></td>
<td>Vacuum channel inside</td>
</tr>
<tr>
<td></td>
<td>SiC coating</td>
</tr>
<tr>
<td></td>
<td>Mirror polished surface</td>
</tr>
</tbody>
</table>

### Chamber Window & Tube

<table>
<thead>
<tr>
<th>Material</th>
<th>Sapphire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Features</td>
<td>High purity</td>
</tr>
<tr>
<td></td>
<td>High plasma durability</td>
</tr>
<tr>
<td></td>
<td>Transparent</td>
</tr>
<tr>
<td></td>
<td>High transmission factor</td>
</tr>
</tbody>
</table>
**Vacuum Chuck**

- **Material**: Al₂O₃, Porous Al₂O₃, SiC
- **Size**: For 200mm / 300mm equipment
- **Features**:
  - High purity
  - High chemical durability
  - Vacuum channel inside
  - Variety surface shape

**Nozzle**

- **Material**: Al₂O₃
- **Size**: Nozzle diameter +/-5
- **Features**:
  - High plasma durability
  - Gas flow rate control

**End Effector**

- **Material**: Al₂O₃, 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

**USM Stage - Assembly Technology**

- **Material**: Al₂O₃, Al, Non Magnetic Metal, etc.
- **Features**:
  - Ultrasonic Motor drive
  - High positioning accuracy
  - Compact design

**Metalized Products - Metal Assembly Technology**

- **Material**: Al₂O₃, Al, Stainless steel, etc.
- **Application**: IC Packages
- **Features**:
  - 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.