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

#### Unit Conversion Table

**Stress**

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Measuring Method</th>
<th>Silicon Nitride (Si3N4)</th>
<th>Silicon Carbide (SiC)</th>
<th>Aluminum Nitride (AIN)</th>
<th>Cordierite (2MgO·2Al2O3·5SiO2)</th>
<th>Yttria (Y2O3)</th>
<th>Zirconia (ZrO2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>99%</td>
<td>White</td>
<td>99.5%</td>
<td>99.5%</td>
<td>99.7%</td>
<td>99.9%</td>
<td>99.9%</td>
<td>99.9%</td>
</tr>
<tr>
<td>Bulk Density</td>
<td>g/cm³</td>
<td>JIS R1634</td>
<td>3.8</td>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
<td>3.9</td>
</tr>
<tr>
<td>Water Absorption</td>
<td>%</td>
<td>JIS R1634</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Vickers Hardness HVT (Load=9.807N) (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>
<td></td>
</tr>
<tr>
<td>Flexural Strength (3PB) R.T. (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>
</tr>
<tr>
<td>Young’s Modulus of Elasticity (GPa)</td>
<td>JIS R1602</td>
<td>360</td>
<td>370</td>
<td>370</td>
<td>380</td>
<td>380</td>
<td>470</td>
<td></td>
</tr>
<tr>
<td>Poisson’s Ratio</td>
<td></td>
<td>JIS R1602</td>
<td>0.23</td>
<td>0.23</td>
<td>0.23</td>
<td>0.23</td>
<td>0.23</td>
<td></td>
</tr>
<tr>
<td>Fracture Toughness (SEPB)</td>
<td>MPa m/²</td>
<td>JIS R1607</td>
<td>3 ~ 4</td>
<td>4</td>
<td>4</td>
<td>5 ~ 8</td>
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<td></td>
</tr>
<tr>
<td>Coefficient of Linear Thermal Expansion</td>
<td>40°C ~ 400°C x10⁵/°C</td>
<td>JIS R1618</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
<td>7.7</td>
</tr>
<tr>
<td>Thermal Conductivity 20°C W/(m·k)</td>
<td>JIS R1611</td>
<td>29</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>34</td>
<td>34</td>
<td>41</td>
</tr>
<tr>
<td>Specific Heat</td>
<td>J/g(k)</td>
<td>JIS R1615</td>
<td>0.79</td>
<td>0.78</td>
<td>0.78</td>
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<tr>
<td>Heat Shock Resistance</td>
<td>°C</td>
<td>JIS R1648</td>
<td>200</td>
<td>250</td>
<td>250</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Dielectric Strength</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>O·cm</td>
<td>JIS C2141</td>
<td>10² ~ 10⁶ ≥10²</td>
<td>≥10²</td>
<td>≥10²</td>
<td>≥10²</td>
<td>≥10²</td>
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</tr>
<tr>
<td>Dielectric Constant (1MHz)</td>
<td>-</td>
<td>JIS C2141</td>
<td>9.9</td>
<td>9.9</td>
<td>9.9</td>
<td>9.9</td>
<td>9.9</td>
<td>11.5</td>
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<tr>
<td>Dielectric Loss Angle (1MHz)</td>
<td>(X10⁷)</td>
<td>JIS R1614</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>&lt;1</td>
<td></td>
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<tr>
<td>Loss Factor</td>
<td>JIS R1614</td>
<td>0.10</td>
<td>0.07</td>
<td>0.05</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
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<tr>
<td>Nitric Acid(60%)</td>
<td>%</td>
<td>JIS R1634</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sulphuric Acid(95%)</td>
<td>%</td>
<td>JIS R1634</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Caustic Soda(30%)</td>
<td>%</td>
<td>JIS R1634</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</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: Al$_2$O$_3$
- 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: Al$_2$O$_3$, SiC, Si$_3$N$_4$
- 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
**Alumina Wafer Polishing Plate / Turn Table**
- **Material**: Al₂O₃
- **Size**: Up to 39” in diameter
- **Features**:
  - High rigidity
  - High chemical durability
  - Surface shape & roughness control

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- **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, AIN, 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**: AIN
- **Size**: For 200mm / 300mm equipment
- **Features**:
  - High purity
  - High plasma durability
  - Uniform thermal distribution
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 μm
- **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
### 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 mm
- **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
  - 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