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 Measuring Method</th>
<th>Alumina (A.O.)</th>
<th>Sapphire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td></td>
<td>JIS R1634</td>
<td>3.9</td>
<td>3.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>99.9% White</td>
<td>99.5% Ivory</td>
<td>99.5% Ivory</td>
</tr>
<tr>
<td>Bulk Density</td>
<td>g/cm³</td>
<td>JIS R1634</td>
<td>3.8</td>
<td>3.9</td>
</tr>
<tr>
<td>Water Absorption</td>
<td>% JIS R1634</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Vickers Hardness HV1 (Load=9.807N) (GPa)</td>
<td>JIS R1610</td>
<td>15.2</td>
<td>16.0</td>
<td></td>
</tr>
<tr>
<td>Flexural Strength (3PB) R.T.</td>
<td>MPa</td>
<td>JIS R1601</td>
<td>310</td>
<td>360</td>
</tr>
<tr>
<td>Young’s Modulus of Elasticity</td>
<td>GPa</td>
<td>JIS R1602</td>
<td>360</td>
<td>370</td>
</tr>
<tr>
<td>Poisson’s Ratio</td>
<td></td>
<td>JIS R1602</td>
<td>0.23</td>
<td>0.23</td>
</tr>
<tr>
<td>Fracture Toughness (SEPB)</td>
<td>MPam</td>
<td>JIS R1607</td>
<td>3 ~ 4</td>
<td>4</td>
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<tr>
<td>Coefficient of Linear Thermal Expansion</td>
<td>JIS R1618</td>
<td>7.2</td>
<td>7.2</td>
<td></td>
</tr>
<tr>
<td>Thermal Conductivity 20°C</td>
<td>W/(m·K)</td>
<td>JIS R1611</td>
<td>29</td>
<td>32</td>
</tr>
<tr>
<td>Specifc Heat Capacity</td>
<td>J/kg(K)</td>
<td>JIS R1611</td>
<td>0.78</td>
<td>0.78</td>
</tr>
<tr>
<td>Heat Shock Resistance</td>
<td>°C JIS R1648</td>
<td>200</td>
<td>250</td>
<td>-</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>KV/mm</td>
<td></td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Volume Resistivity</td>
<td>0 · cm</td>
<td>JIS C2141</td>
<td>10¹⁰</td>
<td>10¹⁰</td>
</tr>
<tr>
<td>Dielectric Constant (1MHz)</td>
<td></td>
<td></td>
<td>9.9</td>
<td>9.9</td>
</tr>
<tr>
<td>Dielectric Loss Angle (1MHz)</td>
<td>(X10⁶)</td>
<td></td>
<td>1</td>
<td>1 &lt;1</td>
</tr>
<tr>
<td>Loss Factor</td>
<td>(X10⁶)</td>
<td></td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Nitric Acid(60%)90°C</td>
<td>WT Loss</td>
<td></td>
<td>0.10</td>
<td>0.07</td>
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<tr>
<td>Sulphuric Acid(95%)95°C</td>
<td></td>
<td></td>
<td>0.33</td>
<td>0.25</td>
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<tr>
<td>Cautious Soda(30%)80°C</td>
<td></td>
<td></td>
<td>0.26</td>
<td>0.05</td>
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</tbody>
</table>

### Unit Conversion Table

#### Stress

<table>
<thead>
<tr>
<th>Stress</th>
<th>Mpa</th>
<th>Kg/mm²</th>
<th>Kg/cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.807</td>
<td>1 × 10⁴</td>
<td>1.0197 × 10⁴</td>
<td></td>
</tr>
<tr>
<td>9.807 × 10⁴</td>
<td>1 × 10⁷</td>
<td>1.0197 × 10⁷</td>
<td></td>
</tr>
</tbody>
</table>

#### Thermal Conductivity

<table>
<thead>
<tr>
<th>Material</th>
<th>W/(m·K)</th>
<th>Cal/cm</th>
<th>°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.38 × 10⁴</td>
<td>1.163</td>
<td>2.78 × 10⁴</td>
</tr>
</tbody>
</table>

### Notes

1. These values are only for reference, showing the measurement results of test pieces specified.
2. The values may change dependent on the using conditions and the shape of products.
3. 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**: 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
**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