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
<table>
<thead>
<tr>
<th>Item</th>
<th>Material</th>
<th>Unit</th>
<th>Measuring Method</th>
<th>Alumina (AO)</th>
<th>Sapphire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulk Density</td>
<td></td>
<td>g/cm³</td>
<td></td>
<td>99% White</td>
<td></td>
</tr>
<tr>
<td>Water Absorption</td>
<td></td>
<td>‰</td>
<td></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Vickers Hardness HVT (Load=9.807N)</td>
<td></td>
<td>(GPa)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexural Strength (3PB) R.T.</td>
<td></td>
<td>MPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young’s Modulus of Elasticity</td>
<td></td>
<td>GPA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poisson’s Ratio</td>
<td></td>
<td></td>
<td></td>
<td>0.23</td>
<td></td>
</tr>
<tr>
<td>Fracture Toughness (SEPB)</td>
<td></td>
<td>MPam⁻¹</td>
<td></td>
<td>3 ~ 4</td>
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</tr>
<tr>
<td>Coefficient of Linear Thermal Expansion</td>
<td>40°C ~ 400°C x10¹⁵/°C</td>
<td></td>
<td></td>
<td>7.2</td>
<td></td>
</tr>
<tr>
<td>Thermal Conductivity 20°C</td>
<td></td>
<td>W/(m·k)</td>
<td></td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Specific Heat</td>
<td></td>
<td>J/g(k)</td>
<td></td>
<td>0.78</td>
<td></td>
</tr>
<tr>
<td>Heat Shock Resistance</td>
<td></td>
<td>°C</td>
<td></td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td></td>
<td>KV/mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volume Resistivity</td>
<td></td>
<td>0.1 cm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dielectric Constant (1MHz)</td>
<td></td>
<td>JIS C2141</td>
<td></td>
<td>9.98</td>
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</tr>
<tr>
<td>Dielectric Loss Angle (1MHz) (X10¹⁰)</td>
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<td></td>
<td></td>
<td>2</td>
<td></td>
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<tr>
<td>Loss Factor</td>
<td></td>
<td>(X10¹⁰)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Nitric Acid(60%)90°C</td>
<td></td>
<td>mg/cm³</td>
<td></td>
<td>0.10</td>
<td></td>
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<tr>
<td>Sulphuric Acid(95%)95°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Cautious Soda(90%)80°C</td>
<td></td>
<td></td>
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</tbody>
</table>

**Material Characteristics**

**Unit Conversion Table**

<table>
<thead>
<tr>
<th>Stress</th>
<th>Measuring Method</th>
<th>Alumina (AO)</th>
<th>Sapphire</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></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>
</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
### Alumina Wafer Polishing Plate / Turn Table
- **Material**: \( \text{Al}_2\text{O}_3 \)
- **Size**: Up to 39” in diameter
- **Features**:
  - High rigidity
  - High chemical durability
  - Surface shape & roughness control

### Silicon Carbide Wafer Polishing Plate
- **Material**: \( \text{SiC} \)
- **Size**: Up to 30” in diameter
- **Features**:
  - High thermal conductivity
  - Low thermal expansion
  - High rigidity

### Pad Dresser
- **Material**: \( \text{Al}_2\text{O}_3, \text{SiC}, \text{Si}_3\text{N}_4 \)
- **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

### Plasma Proof Dome
- **Material**: \( \text{Al}_2\text{O}_3 \)
- **Size**: For 200mm / 300mm equipment
- **Features**:
  - High purity
  - High plasma durability

### Plasma Proof Ring
- **Material**: \( \text{Al}_2\text{O}_3, \text{Y}_2\text{O}_3 \)
- **Size**: For 200mm / 300mm equipment
- **Features**:
  - High purity
  - High plasma durability

### Electro-Static Chuck
- **Material**: \( \text{Al}_2\text{O}_3, \text{AIN}, \text{Sapphire} \)
- **Size**: For 200mm / 300mm equipment
- **Features**:
  - High purity
  - High plasma durability
  - Good chucking / de-chucking response
  - High temp. and low temp. application

### Heater
- **Material**: \( \text{AIN} \)
- **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 \( \mu \text{m} \)
- **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

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**Example**

<table>
<thead>
<tr>
<th>Material</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metalized Products - Metal Assembly Technology</td>
<td>IC Packages, High vacuum component, High voltage terminal, etc.</td>
</tr>
<tr>
<td>Coating Technology</td>
<td>Discharge of static electricity, Soft contact</td>
</tr>
<tr>
<td>Large Size Product Manufacturing Technology</td>
<td>LCD manufacturing equipment, Lithography equipment</td>
</tr>
<tr>
<td>Material Development Technology</td>
<td>Lithography equipment, Wafer Inspection equipment</td>
</tr>
<tr>
<td>USM Stage - Assembly Technology</td>
<td>Ultrasonic Motor drive, High positioning accuracy, Compact design</td>
</tr>
</tbody>
</table>