MECHANICAL & INDUSTRIAL CERAMICS
Today, at the dawn of the 21st century, materials are continually being developed and improved, blending a wide spectrum of technologies. The most exciting evolution of all materials, however, is occurring in engineering ceramics.

In Kyocera’s advanced manufacturing of fine ceramics, it is possible to bring forth ceramics maximum performance.

Kyocera’s fine ceramic products are widely used in industrial machines and electronic equipment and devices. The superior electrical characteristics of fine ceramics are utilized in a variety of circuit boards and electronic parts. Their wear and corrosion resistance is beneficial in pumps, nozzles and valve parts, and their high heat and thermal shock resistance is useful in ceramic engine parts.

Based on its advanced ceramics technology, Kyocera put into practical use its ultra-precision processing technology in the manufacturing of OA equipment parts and fiber optic connectors where high precision is required. The applications of fine ceramics continue to expand, from single to multicomponent products such as air slides and X-Y tables.

Kyocera, with its highly sophisticated technology and expanding capacity, is determined to disseminate fine ceramics into every corner of industry. It is dedicated to enhancing human productivity, cultivating the future of tomorrow’s technological society.
Silicon Carbide

Zirconia

Please visit our website for details

https://global.kyocera.com/prdct/fc/index.html
UNRIVALED R&D

In today’s information society, marketing research and technical development capacities hold the key to the future of an enterprise. In order to accurately meet client needs, Kyocera established an integral R&D organization. Performing stringent quality control over every detail of the manufacturing process.

In developing new products, Kyocera’s R&D operations are centralized in the General Research Institute. They conduct thorough studies to continually enhance and develop materials and manufacturing techniques. The engineering and business divisions perform commercialization, repeating product reliability tests until complete confidence is reached.

Under supervisors with a strong sense of responsibility, everyone, from development to manufacturing, conducts thorough product control, so that highly reliable, high performance products will be delivered.

Using the best combination of materials and technologies available, Kyocera promotes flexibility to meet the diversified industry needs with its ultimate goal to produce superior products.
ASSEMBLY PRODUCTS

AUTOMOTIVE PARTS

● Gas turbine parts
The gas turbine, clean in energy consumption and superior in thermal efficiency is being heralded as the leading engine for the 21st century. The development and commercialization of engineering ceramics, which can withstand severe conditions such as high temperatures and heavy loads, holds the key to the success of the gas turbine engine.

● Engine parts
Triggered by the commercialization of the ceramic glow plug, the application of ceramics to engine parts has increased due to ceramics superior heat resistance and high temperature strength.

PUMP PRODUCTS

● Progressive cavity pump
The pump’s rotor and stator consist of wear and heat resistant ceramics in order to transport high temperature liquids, slurry fluids and foods.

● Ceramic centrifugal pump
In this type of pump, all liquid-contact parts are made of 99.5% pure alumina, which is best suited for the transportation of chemical liquids, organic solvents and slurry fluids.

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●Air slide

Air slides, for X-Y tables and measuring units, are manufactured using Kyocera’s advanced processing technology, creating unprecedented high precision and reliability.

●Air spindle

In the high-tech industry, there is a demand for light-weight air spindles. Kyocera’s ceramic air spindles are used in rotary tables or, coupled with a motor to form turning units. These applications benefit from ceramics high rigidity and superior rotational precision.

●X-Y table

X-Y tables benefit from the ceramic air slides high precision, simple maintenance and non-magnetism. X-Y tables are used in semiconductor manufacturing equipment, precision measuring instruments, and high precision processing machines.

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With sintered alumina as a base, many other types of ceramic materials have been developed. These fine ceramics are classified according to their use, specifically functional materials (electroceramics) and structural materials (engineering ceramics). As the pioneer in the fine ceramics materials revolution, Kyocera continually develops and provides the most advanced ceramics.

**ALUMINA CERAMICS \((\text{Al}_2\text{O}_3)\)**

Alumina is the most widely used type of ceramic. Its high dielectric properties are beneficial in electrical products. Alumina offers corrosion and wear resistance and high strength. It is widely used for industrial machine parts.

**SILICON NITRIDE CERAMICS \((\text{Si}_3\text{N}_4)\)**

Silicon nitride exceeds other ceramics in thermal shock resistance. Its strength does not deteriorate at elevated temperatures, hence it is most appropriate for engine and gas turbine parts, including turbo charger rotors, diesel engine glow plugs and hot plugs.

**MULLITE CERAMICS \((3\text{Al}_2\text{O}_3, 2\text{SiO}_2)\)**

Mullite has a low thermal expansion coefficient and is used in parts requiring heat and thermal shock resistance, such as burner nozzles and tiles.

**TITANIA CERAMICS**

Titania excels in surface smoothness and wear resistance. By the addition of CaO or BaO titania, the materials conductivity allows it to be used in static free applications such as guides and sliders.

**CERMET \((\text{TiC}, \text{TiN})\)**

By the addition of metal components such as cobalt, nickel, or molybdenum, composite ceramics known as cermets are formulated.

**SILICON CARBIDE CERAMIC \((\text{SiC})\)**

Silicon carbide retains its strength at elevated temperatures as high as 1400°C. It has the highest corrosion resistance of all fine ceramic materials. Applications include mechanical seals and pump parts.

**ZIRCONIA CERAMICS \((\text{ZrO}_2)\)**

Zirconia ceramic has the highest strength and toughness at room temperature of all engineering ceramics. Before zirconia, ceramics were considered impractical for scissors or knife applications. With its excellent surface smoothness, zirconia is also used for pump parts.

**CORDIERITE CERAMICS \((2\text{MgO, 2Al}_2\text{O}_3, 5\text{SiO}_2)\)**

Cordierite features a very low thermal expansion coefficient.

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MANUFACTURING PROCESS

RAW MATERIAL MILLING AND MIXING

SPRAY DRYING

RAW MATERIAL

ISOSTATIC PRESSING

DRY PRESSING

FORMING

MACHINING

HOT PRESSING

SINTERING

EXTRUSION

SINTERING

CASTING

INJECTION MOLDING

SINTERING

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RAW MATERIAL
CASTING
FORMING
SINTERING
■ RAW MATERIAL MILLING
■ AND MIXING
■ SPRAY DRYING
■ ISOSTATIC PRESSING
■ DRY PRESSING
■ EXTRUSION
■ INJECTION MOLDING
■ METALLZING
■ BONDING
■ INSPECTION
■ MACHINING
■ HOT PRESSING
■ SINTERING
■ HIP (HOT ISOSTATIC PRESSING)
■ GRINDING AND BONDING
■ GRINDING AND LAPPING

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OA equipment parts

As computers increase in memory capacity, floppy and hard disk drives use ceramic sliders that possess superior characteristics and high precision.

With the size reduction and sophistication of OA equipment, ceramic shafts, lighter in weight and with increased wear resistance and precision, are quickly replacing metal shafts.

In meeting the need for greater speed and higher density dot matrix printers, precision ceramic wire guides are used.
Wafer polishers

Ceramic plates are used to mount and adhere wafers during finishing to enhance flatness and other surface conditions. Ceramics are also used for the dressing plate.

Semiconductor processing machine jigs

Superior in chemical, heat and wear resistance, ceramics are used in semiconductor processing machines such as CVD equipment, etching machines and light exposer, to hold, transport and heat-treat wafers.

Measuring instrument parts

Ceramics are widely used in measuring instruments for their structural and non-corrosive properties. Their hardness prevents gouging, bulging and burring along with consistent precision measurements.

Fiber optic connectors

Ceramic parts, such as ferrules and sleeves, finished to ultra-precision are used in connectors requiring sub-micron precision.

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Pump and valve parts

Ceramics are used in pump plungers, magnetic pump shafts and sleeves for superior wear resistance. In ball and faucet valves, ceramics are used to provide excellent sealing quality and wear resistance.
Medical equipment and chemical analyzer parts

The chemical stability of ceramics permits their application to the artificial kidney pump. Free from corrosion and superior in cleaning properties, ceramic materials are also used in blood valves.

Nozzles

Scrubber nozzles require ceramics excellent chemical and wear resistance. In cleaning nozzles, through which water flows at a high rate, wear resistance is essential. Ceramics superior heat resistance is utilized in welder and burner nozzles.

Grinding mill parts

Benefiting from high wear resistance, grinding mills use ceramics for their liners, agitator screws and rollers. Ball mill balls are manufactured from the same materials being milled.

Food machine parts

The inherent cleanliness and simple cleaning procedures of ceramics are greatly appreciated in kneading rollers, and in parts for filling machines such as valves and pumps.
Ceramics, superior in wear resistance, are used in cleaner cones separating foreign matter from pulp slurry.

**Papermaking parts**

Ceramics, superior in wear resistance, are used in cleaner cones separating foreign matter from pulp slurry.
Molten metal processing parts

Wire drawing machine parts

To benefit from ceramics wear resistance and light weight, wire drawing machine parts use ceramics in capstan rollers and wire guide rollers.

Thread guides

Ceramic is used in guide parts for thread processing and oiling nozzles, rollers and twining parts because of its high wear resistance, very low susceptibility to damage by high-speed running of thread, and low friction coefficient.

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WEAR AND HEAT RESISTANT PARTS

Cutters

Of all ceramic materials, zirconia exceeds in strength, toughness and wear resistance, and is used in industrial cutters and slitters to process fiber, paper, film and similar materials. Cermet, which can be brazed and electric charge-processed, is used in cutters and wear resistant precision parts, in combination with metal.

Physiochemical equipment parts

Superior chemical and heat resistance with no outgasing at high temperatures allow high purity alumina ceramics to be used in analytical equipment.

Ceramic heaters

Alumina heaters, are manufactured by printing resistors on alumina sheets, then laminating and sintering them into one piece. Silicon nitride heaters are manufactured by printing resistors on silicon nitride or embedding them therein. Ceramic heaters find use in a wide range of industrial fields.

Living and household appliances

Less subject to rust and more wear resistant than conventional metal, ceramics are used for knives, golf and baseball spikes, clock casings and many other sport and recreational appliances.

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With Kyocera’s unique ceramic precision machining technology, formed material is cut, ground and lapped after sintering to required shapes. These products are used for their unrivaled performance in OA sliding parts as general structural members, precision jigs and tools, in wear and chemical resistant sliding parts and also in electromagnetic fields and chemical solutions.

### Dimensional precision achieved by machining

When dimensional precision is required for machined ceramics, Kyocera is capable of achieving the tolerances as shown in the table below. If greater tolerances are required, please consult us.

#### MACHINING DIMENSIONAL PRECISION

(Data are in mm unless otherwise specified)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standard Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \phi )</td>
<td>( (\square) 5 \sim \phi (\square) 30 )</td>
</tr>
<tr>
<td>Parallelism</td>
<td>0.02</td>
</tr>
<tr>
<td>Flatness</td>
<td>0.01</td>
</tr>
<tr>
<td>Surface Roughness</td>
<td>1.5 ( \mu ) Ra</td>
</tr>
<tr>
<td>Mirror Polishing</td>
<td>0.2 ( \mu ) Ra</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standard Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roundness</td>
<td>0.01</td>
</tr>
<tr>
<td>Perpendicularity</td>
<td>0.01 (30’</td>
</tr>
<tr>
<td>Straightness</td>
<td>0.05/100</td>
</tr>
<tr>
<td>Surface Roughness</td>
<td>1.5 ( \mu ) Ra</td>
</tr>
</tbody>
</table>

#### PRECISION MACHINED PRODUCTS

Ultra-precision is possible with Kyocera’s unique techniques. Precision machining is affected by shape and material. Some practical examples are shown in the table below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Dimensions</th>
<th>Material</th>
<th>Example of Machining</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner Diameter</td>
<td>( \phi ) 6xL20</td>
<td>AO479S</td>
<td>( \pm 3 ) ( \mu ) m</td>
</tr>
<tr>
<td>Outer Diameter</td>
<td>( \phi ) 40xL30</td>
<td>AO479S</td>
<td>( \pm 1 ) ( \mu ) m</td>
</tr>
<tr>
<td>Plate</td>
<td>( \phi ) 40xT5</td>
<td>AO479S</td>
<td>( \pm 1 ) ( \mu ) m</td>
</tr>
</tbody>
</table>

* Surface roughness depends on the material. The data shown here indicates where alumina is used.

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Surface Characteristics

Kyocera’s comprehensive technology, from material control to forming and sintering allows its fine ceramic products excellent surface smoothness and flatness.

- **Surface Roughness (Alumina)**
  - 1. As fired (3 \( \mu \) Ra)
  - 2. Ground (1 \( \mu \) Ra)
  - 3. Lapped (0.4 \( \mu \) Ra)
  - 4. Polished (0.2 \( \mu \) Ra or less)

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Screwing

Used for junctions subject to strong impact such as in machine mechanisms.

Shrink-fitting

Based on the higher compression resistance and lower thermal expansion of ceramics, it is used to reinforce ceramic pipes subject to internal pressure.

Resin molding

Ceramic parts are inserted and formed into desired shapes. Simple design is possible.
Molybdenum-manganese process

A typical method used to seal ceramics and metal. Molybdenum-manganese paste is used as metal film is baked on the ceramics surface. The film formed is bonded to metal by high temperature brazing.

Nickel paste process

Nickel paste is used as metal film is baked on the ceramics surface.

Active metal method

Very active metals, such as titanium, zircon, nickel, copper and silver are inserted between the ceramics and the material to be bonded, then heated in a special atmosphere.

Metal casting

The thermal shock resistance of silicon carbide is beneficial in metal casting. Molten metal (aluminum and zinc) is cast around ceramic material, then formed.

Organic adhesive

Used to bond ceramics and various materials. The method is simple and is applied to parts at room temperature.

Glazing

Used when special reliability, such as straightness, is required for junctions or when external gas must be kept out or the vacuum condition.

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MATERIALS COMPARISON CHART

Density

Flexural Strength

Hardness

Compressive Strength

Young’s Modulus of Elasticity

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Please visit our website for details https://global.kyocera.com/prdct/fc/index.html

**Thermal Expansion**

- **Flexural Strength (MPa)**
  - 1000
  - 1200
  - 1400
  - 1600

- **Young’s Modulus (GPa)**
  - 100
  - 200
  - 300
  - 400
  - 500

- **Bulk Density (g/cm³)**
  - 10
  - 15
  - 20

**Heat Shock Resistance**

- **Flexural Strength After Quenching (MPa)**
  - Weight Loss by Erosion (mg/cm²)

**Thermal Conductivity**

- **Thermal Conductivity (W/(m・K))**
  - 10
  - 20
  - 30
  - 40
  - 50
  - 60

**Chemical Durability**

- **Chemical Durability:** Materials : Kyocera condition
  - Metals : 30 min boiling

**Unit Conversion Table**

- **Stress:**
  - MPa or N/mm² → kgf/mm² → psi(=lbf/in²)
  - 1 MPa = 1.020×10³ kgf/mm² = 1.450×10⁵ psi

- **Thermal Conductivity:**
  - W/(m・K) → kcal/(m・h・°C) → cal/(cm・sec・℃)
  - 1 W/(m・K) = 8.860×10⁻¹ kcal/(m・h・°C) = 2.389×10⁻³ cal/(cm・sec・℃)
<table>
<thead>
<tr>
<th>Item</th>
<th>Material</th>
<th>ALUMINA (Al₂O₃)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Code (Old)</td>
<td>A482R</td>
<td>A459</td>
</tr>
<tr>
<td>Material Code (New)</td>
<td>AO482R</td>
<td>AO459K</td>
</tr>
<tr>
<td>Appearance</td>
<td>Porous</td>
<td>Dense</td>
</tr>
<tr>
<td>Color</td>
<td>Pink</td>
<td>Russet</td>
</tr>
<tr>
<td>Content (%)</td>
<td>A₉₂O₃</td>
<td>89</td>
</tr>
</tbody>
</table>

**Main Characteristics**
- High Heat Resistance
- Good for Metallizing
- Light Interception, High Heat Dissipation
- Wear Resistant
- Good for Metallizing, Mechanically Strong
- Wear Resistant
- Good Surface Smoothness
- Hard and Chemically Stable

**Main Applications**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density (g/cm³)</td>
<td>JIS R 1634</td>
</tr>
<tr>
<td>Water Absorption (%)</td>
<td>JIS C 2141</td>
</tr>
<tr>
<td>Vickers Hardness HV9.807N</td>
<td>GPa</td>
</tr>
<tr>
<td>Flexural Strength 3 P.B.</td>
<td>MPa</td>
</tr>
<tr>
<td>Compressive Strength</td>
<td>MPa</td>
</tr>
<tr>
<td>Young’s Modulus of Elasticity</td>
<td>GPa</td>
</tr>
<tr>
<td>Poisson’s Ratio</td>
<td>—</td>
</tr>
<tr>
<td>Fracture Toughness (SEP) MPa·m¹/²</td>
<td>JIS R 1607</td>
</tr>
<tr>
<td>Coefficient of Linear Thermal Expansion 40 ~ 400°C</td>
<td>× 10⁻⁶/K</td>
</tr>
<tr>
<td></td>
<td>40 ~ 800°C</td>
</tr>
<tr>
<td>Thermal Conductivity 20°C</td>
<td>W/(m·K)</td>
</tr>
<tr>
<td>Specific Heat Capacity J/(g·K)</td>
<td>JIS R 1611</td>
</tr>
<tr>
<td>Fracture Toughness (SEP)</td>
<td>—</td>
</tr>
<tr>
<td>Dielectric Strength kV/mm</td>
<td>—</td>
</tr>
<tr>
<td>Volume Resistivity 20°C</td>
<td>Ω·cm</td>
</tr>
<tr>
<td>300°C</td>
<td>—</td>
</tr>
<tr>
<td>500°C</td>
<td>—</td>
</tr>
<tr>
<td>Dielectric Constant (1MHz)</td>
<td>—</td>
</tr>
<tr>
<td>Dielectric Loss Angle (1MHz)</td>
<td>(× 10⁻⁵)</td>
</tr>
<tr>
<td>Loss Factor</td>
<td>(× 10⁻⁴)</td>
</tr>
<tr>
<td>Nitric Acid (60%) 90°C,24H</td>
<td>(Weight Loss) mg/cm²</td>
</tr>
<tr>
<td>Sulphuric Acid (95%) 95°C,24H</td>
<td>—</td>
</tr>
<tr>
<td>Sodium Hydroxide (30%) 80°C,24H</td>
<td>—</td>
</tr>
</tbody>
</table>

The values are typical material properties and may vary according to products configuration and manufacturing process. For more details, Please feel free to contact us. *1: All values for apparent density and bulk density are the same, except for A482R which lists apparent density only.

* Please visit our website for details | https://global.kyocera.com/prdct/fc/index.html
### Main Applications

- **Material Code (Old)**
- **Chemical**
- **Thermal Characteristics**
- **Mechanical Characteristics**
- **Loss Factor**
- **Volume**
- **Thermal Coefficient**
- **Poisson's Ratio**
- **Young's Modulus of Elasticity**
- **Vickers Hardness HV9.807N**
- **Sodium Hydroxide**
- **Fracture Toughness (SEPB)**

### Water Absorption

- **Main Applications**
- **Color**
- **Appearance**

### Material Properties

- **Density**
- **Moisture Absorption**
- **Dielectric Constant**
- **Dielectric Loss Tangent**
- **DC Conductivity**
- **DC Breakdown Voltage**
- **DC Breakdown Field**
- **Surface Resistance**
- **Volume Resistivity**
- **Insulation Resistance**

### Typical Material Properties

- **A479S**
- **A479M**
- **A479G**
- **A480S**
- **A601D**
- **A601L**
- **AO479S**
- **AO479G**
- **AO479L**

### Typical Values

- **Loss Factor**
- **Volume**
- **Thermal Coefficient**
- **Poisson's Ratio**
- **Young's Modulus of Elasticity**
- **Vickers Hardness HV9.807N**

### Table

<table>
<thead>
<tr>
<th>Material</th>
<th>CORDIERITE (2MgO・2Al2O3・5SiO2)</th>
<th>STEATITE (MgO・SiO2)</th>
<th>FORSTERITE (2MgO・SiO2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A479S</td>
<td>SA100</td>
<td>CO220</td>
<td>S210</td>
</tr>
<tr>
<td>A479M</td>
<td></td>
<td>CO720</td>
<td>S211</td>
</tr>
<tr>
<td>A479G</td>
<td></td>
<td></td>
<td>F1120</td>
</tr>
<tr>
<td>AO479S</td>
<td></td>
<td>CO2200</td>
<td>S2010</td>
</tr>
<tr>
<td>AO479G</td>
<td></td>
<td>CO7200</td>
<td>S0210</td>
</tr>
<tr>
<td>A480S</td>
<td></td>
<td></td>
<td>F11200</td>
</tr>
<tr>
<td>A601D</td>
<td></td>
<td></td>
<td>F0120</td>
</tr>
<tr>
<td>A601L</td>
<td></td>
<td></td>
<td>F10230</td>
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</tbody>
</table>

### Additional Information

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# CHARACTERS

<table>
<thead>
<tr>
<th>Item</th>
<th>Material</th>
<th>YTTRIA (Y₂O₃)</th>
<th>TITANIA</th>
<th>SILICON CARBIDE (SiC)</th>
<th>Si</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Code (Old)</td>
<td>YO100A</td>
<td>T716</td>
<td>T716H</td>
<td>T792H</td>
<td>SC211</td>
<td>SC1000</td>
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<tr>
<td>Material Code (New)</td>
<td>YO100A</td>
<td>TO716O</td>
<td>TO716H</td>
<td>TO792H</td>
<td>SC211O</td>
<td>SC1000</td>
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<tr>
<td>Appearance</td>
<td>Dense</td>
<td>Dense</td>
<td>Dense</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>White</td>
<td>Light Brown</td>
<td>Light Brown</td>
<td>Grayish Yellow</td>
<td>Black</td>
<td>Black</td>
</tr>
<tr>
<td>Content</td>
<td>(%)</td>
<td>--</td>
<td>--</td>
<td></td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Main Characteristics</td>
<td></td>
<td>--</td>
<td>--</td>
<td></td>
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<tr>
<td>Main Applications</td>
<td></td>
<td>--</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Density (×1)

<table>
<thead>
<tr>
<th>Item</th>
<th>g/cm³</th>
<th>JIS R 1634</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Absorption</td>
<td>4.9</td>
<td>3.9</td>
</tr>
<tr>
<td>Vickers Hardness HV9.807N</td>
<td>6.0</td>
<td>8.5</td>
</tr>
<tr>
<td>Flexural Strength 3 P.B.</td>
<td>130</td>
<td>320</td>
</tr>
<tr>
<td>Compressive Strength</td>
<td>MPa</td>
<td>MPa</td>
</tr>
<tr>
<td>Young’s Modulus of Elasticity</td>
<td>GPa</td>
<td>GPa</td>
</tr>
<tr>
<td>Poisson’s Ratio</td>
<td></td>
<td>GPa</td>
</tr>
<tr>
<td>Fracture Toughness (SEP)</td>
<td>MPa·m¹/²</td>
<td>JIS R 1607</td>
</tr>
<tr>
<td>Coefficient of Linear Thermal Expansion</td>
<td>10⁻⁶/K</td>
<td>JIS R 1618</td>
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<td>Thermal Conductivity</td>
<td>W/(m·K)</td>
<td>JIS R 1611</td>
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<td>Specific Heat Capacity</td>
<td>J/(g·K)</td>
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<td>Thermal Shock Temperature Difference (Put in Water, Relative Method)</td>
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## Electrical Characteristics

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<th>Item</th>
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<tr>
<td>Dielectric Strength</td>
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<td>Volume Resistivity</td>
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<td>Dielectric Constant</td>
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<td>Nitric Acid 60% 90°C,24H</td>
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<td>Sulphuric Acid 95%,95°C,24H</td>
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<td>Caustic Soda 30%,80°C,24H</td>
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The values are typical material properties and may vary according to products configuration and manufacturing process. For more details, Please feel free to contact us.

*1: All values for apparent density and bulk density are the same, except for A482R which lists apparent density only.
## Main Applications

- **LICON NITRIDE**
  - (Si$_3$N$_4$)
  - SN240  SN241
  - Dense
  - Black

- **ALUMINIUM NITRIDE**
  - (AlN)
  - AN216A  AN2000
  - Dense
  - Black

- **ZIRCONIA**
  - (ZrO$_2$)
  - Z220  Z201N  Z701N  Z21H04
  - Dense
  - Gray

- **CERMET**
  - TC30  TC0300

### Main Characteristics

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<td>● High Temperature Strength</td>
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<td>● Wear Resistant</td>
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<td>● Molten Metal Parts</td>
<td>● Metal Forming Tool</td>
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<td>● Semiconductor Processing Equipment Parts</td>
<td>● Pump Parts, Dies, Knives,</td>
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1kgf/mm$^2 = 9.807$MPa
1cal/(cm $\cdot$ sec $\cdot$ °C) = 418.6W/(m $\cdot$ K)

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