Silicon Nitride PCSN4000

General Properties

Silicon Nitride is a lightweight and tough material with good thermal shock properties and high hardness values. It is particularly suitable for any application needing a fracture tough, hard and light material that can be used at elevated temperatures.

Like most technical ceramics, silicon nitride shrinks when sintered and in most applications needs to be ground to remove the outer skin, but as most uses are for tight tolerance components, diamond grinding is usually required in any case.

Silicon Nitride is seen as part of a group of materials with good fracture toughness. Other materials such as Zirconia don’t have the high temperature characteristics of silicon nitride.

See our interactive material comparison table for more information – www.precision-ceramics.com

Typical Applications

- Aerospace Applications
- Bearing Applications
- Chemical Plant Engineering & Construction
- Engine Wear Parts
- Foundry Applications
- Mechanical Engineering
- Medical Components

Typical Properties

<table>
<thead>
<tr>
<th>Process</th>
<th>Extruded Gas Over-Pressure Sintered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Black</td>
</tr>
<tr>
<td>Geometry</td>
<td>High Aspect Ratio Components</td>
</tr>
</tbody>
</table>

The material characteristics listed above are measured with testing samples. They cannot be transferred to components with different size, shape or surface properties. We reserve the right to alter properties within the scope of technical progress or new developments.

General Properties

- Chemical Composition: Si₃N₄
- Sinter Additives: RE₂O₃ / Al₂O₃
- Density: 3.23 g/cm³
- Residual Porosity (%): <1
- Open Porosity (%): 0
- Grain Size (Diameter): 1 - 15 μm

Mechanical Properties

- Compressive Strength (MPa): 3000
- Bending Strength at RT (MPa): 850
- Weibull-Modulus m: 18
- Youngs Modulus E (GPa): >20
- Hardness HV: 16 GPa
- Fracture Toughness Kc: 8.5 MPam³/2
- Poissos Ratio ν: 0.28

Thermal Properties

- Maximum Working Temperatures
  - Inert Atmosphere: 1400 °C
  - Oxidizing Atmosphere: 1200 °C
- Specific Heat Capacity (J/kgK): 700
- Thermal Conductivity λ. (20°C) (W/mK): 28
- Coefficient of Thermal Expansion
  - RT-1000°C (10°K): 3.2
  - RT-250°C (10°K): 1.9
  - RT ± 20°C (10°K): 1.3
- Thermal Shock Parameter Rₙ₁ (K): 700
- Thermal Shock Parameter Rₙ₂ (W/mm): 19

Electrical Properties

- Electrical Resistivity (RT): 10¹² Ωcm
- Dielectric Constant (1 MHz): 7