The Point is this:
When you need the performance of a technical ceramic (high use temperature, electrical resistivity, zero porosity) and your application demands the... privately), look at MACOR MGC. It will lower costs and substantially reduce the time between design and actual use.

Applications

Ultra-High Vacuum Environments
MACOR® Machinable Glass Ceramic is used as an insulator or coil support and for vacuum feed-throughs. In these applications, the conductive materials are supported by the MACOR MGC part and a compatible sealing glass is used to produce a vacuum-tight, hermetic seal.

Constant Vacuum Applications
MACOR MGC parts are found in spacers, headers and windows for microwave tube devices and as sample holders in field ion microscopes.

Aerospace Industry
Over 200 distinctly shaped MACOR MGC parts can be found on America's reusable Space Shuttle Orbiter. Retaining rings of MACOR MGC are used at all hinge points, windows and doors.

Also, large pieces of MACOR glass ceramic are used in a NASA spaceborne gamma radiation detector. For this application, frame corners are joined by a combination of machined (butt-lap) mechanical joints and a sealing glass.

Nuclear-Related Experiments
Since MACOR MGC is not dimensionally affected by irradiation, small cubes of the material are machined to a tolerance of one micron and used as a reference piece to measure dimensional change in other materials.

Welding Nozzles
Welding equipment manufacturers are using MACOR MGC as a nozzle on the tips of oxyacetylene torches. The material’s nonwetting characteristic means molten particles won’t adhere to and decrease the effectiveness of the nozzle.

Fixtures
MACOR MGC is used as an electrode support and burner block in several industrial high heat, electrical cutting operations due to its low thermal conductivity and excellent electrical properties.

Medical Equipment
Producers of medical components are intrigued by MACOR MGC’s inertness, precise machinability and dimensional stability.
The general characteristics of this material described below were derived from laboratory tests performed by Corning from time to time on sample quantities. Actual characteristics of production lots may vary.

### Technical Data

<table>
<thead>
<tr>
<th>Properties</th>
<th>SI/Metric</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>2.52 g/cm³</td>
<td>157 lbs/ft³</td>
</tr>
<tr>
<td>Porosity</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Young’s Modulus, 25°C</td>
<td>66.9 GPa</td>
<td>9.7x10⁶ psi</td>
</tr>
<tr>
<td>Poisson’s Ratio</td>
<td>0.29</td>
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<td>Shear Modulus, 25°C</td>
<td>25.5 GPa</td>
<td>3.7x10⁶ psi</td>
</tr>
<tr>
<td>Hardness, Knoop, 100g</td>
<td>250</td>
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</tr>
<tr>
<td>Rockwell A</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>Modulus of Rupture, 25°C</td>
<td>94 MPa</td>
<td>13,600 psi</td>
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<tr>
<td>Compressive strength</td>
<td>141 MPa</td>
<td>50,000 psi</td>
</tr>
<tr>
<td>Fracture Toughness</td>
<td>1.53 MPa m³/²</td>
<td>1,390 psi in²/²</td>
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### Properties

#### I. Thermal

- **Coefficient of Expansion**
  - -200 - 25°C: 7x10⁻⁶°C⁻¹
  - 25 - 100°C: 9x10⁻⁶°C⁻¹
  - 25 - 600°C: 11x10⁻⁶°C⁻¹
  - 25 - 800°C: 12x10⁻⁶°C⁻¹

- **Specific Heat, 25°C**: 0.82 Btu/lb°F
- **Continuous Operating Temperature**: 800°C
- **Maximum No Load Temperature**: 1000°C

#### II. Mechanical

- **Density**: 2.52 g/cm³
- **Porosity**: 0%
- **Young’s Modulus, 25°C**: 66.9 GPa
- **Poisson’s Ratio**: 0.29
- **Shear Modulus, 25°C**: 25.5 GPa
- **Hardness, Knoop, 100g**: 250
- **Rockwell A**: 48
- **Modulus of Rupture, 25°C**: 94 MPa
- **Compressive strength**: 141 MPa
- **Fracture Toughness**: 1.53 MPa m³/²

#### III. Electrical

- **Dielectric Constant**
  - 25°C: 5.63
  - 1 KHz: 6.03
  - 8.5 GHz: 5.67

- **Loss Tangent**
  - 1 KHz: 4.7x10⁻³
  - 8.5 GHz: 7.1x10⁻³

- **Dielectric Strength (AC) avg.**
  - (at 12 mil thickness and 26°C): 6.03 KV/mm

- **DC Volume Resistivity**: >10¹⁶ ohm-cm

#### IV. Chemical

- **Tests**
  - **Solution**
    - 5% HCL (Hydrochloric Acid)
    - 0.002 N HNO₃ (Nitric Acid)
    - 0.1 N NaHCO₃ (Sodium Bicarbonate)
    - 0.02 N Na₂CO₃ (Sodium Carbonate)
    - 5% NaOH (Sodium Hydroxide)

- **Resistance to water over time**
  - H₂O
    - 7.6
    - 1 day
    - 97°C
    - 0.01
    - 1 day
    - 97°C
    - 0.07
    - 7 days
    - 97°C
    - 9.4
    - 3 days
    - 97°C
    - 0.06
    - 6 days
    - 97°C
    - 0.11

- **Temperature**: °C
  - **Thermal Conductivity**
  - **Dielectric Constant**
  - **Loss Tangent**
MACOR Machinable Glass Ceramic is a white, odorless, porcelain-like (in appearance) material composed of approximately 55% fluorophlogopite mica and 45% borosilicate glass. It has no known toxic effects; however, the dust created in machining can be an irritant. This irritation can be avoided by good housekeeping and appropriate machining techniques. The material contains the following compounds:

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Randomly oriented mica flakes in the microstructure of MACOR MGC are the key to its machinability.

### Composition

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