Superior Technical Ceramics (STC) has been a recognized leader in the aerospace and defense industries for over 40 years. We are an ITAR registered, AS9100 and ISO 9001 certified Small Business. We create specialized ceramic components in partnership with the nation’s most prominent aerospace and defense participants.

Our Services Include

- Materials Design Consulting
- Proprietary Materials Development
- Prototype Manufacturing
- Toll Processing
- Volume Manufacturing for Full Product Life-Cycle Support
- Proof of Concept through Production
- Specializing in Complex Shapes & Exacting Tolerances

### Engine, Exhaust and Propulsion Components:
- Blades, Vanes & Valves
- Combustion Liners
- Fuel System Components
- Igniters, Leads, Nozzles & Shrouds
- Tubes & Rods
- Engine Monitoring Components
- Rupture Discs

### Sensor Components:
- High Temperature Sensor Assemblies
- Turbine Sensors
- Sonar Components
- Thermocouple Housing
- Gas Sensor Components

### Analytical Instrumentation Components:
- Altimeters Components
- Fire Detection Components
- Vibration Sensor Components
- Satellite Positioning Components
- Gyroscope Components
- Turbine Sensors
- Explosive & Chemical Detection

### Guidance and Navigation Components:
- Laser Components
- Missile Guidance Components
- Infrared Navigation Components
- Radomes
- Radar Components

### Custom Development and Commercialization:
- Proprietary Ceramic Material Processing
- Advanced Ceramic Optical Windows & Domes
- Ballistic Transparent Ceramics
- Ceramic Matrix Composite (CMC) Machining
- Ceramic Toll Processing

### Electrical Components:
- Antennas
- Capacitors
- Connectors
- High Voltage Feed-Throughs
- Lighting Components
- Resistors
Technical Ceramic Solutions for the Aerospace & Defense Industry

A Broad Spectrum of Ceramic Material Solutions

We have experience in working with technical ceramics materials, including Alumina (74-99.96%), Zirconia Toughened Alumina (ZTA), YTZP, MSZ, CSZ, and Silicon Nitride (Si₃N₄). The unique attributes of each material allow our engineers to solve individual industry challenges, all while providing cost effective solutions.

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Alumina (ZTA), Zirconia (YTZP, MSZ, CSZ, and Silicon Nitride (Si₃N₄) have been selected for their superior properties in various Aerospace & Defense applications. Alumina is a versatile material with high strength, electrical insulation, and excellent wear resistance.

- **Alumina** has versatile material properties making it a go-to solution for diverse types of aerospace and defense applications. Its high strength along with excellent electrical, thermal, and mechanical properties make it an ideal choice for applications requiring high strength and durability.
- **Zirconia Toughened Alumina (ZTA)** is an excellent choice for applications requiring greater toughness and higher strength than Alumina alone, while maintaining the corrosion resistance of Alumina. This material is used in similar applications as Alumina, but where better performance is required.
- **Zirconia** materials, particularly stabilized Zirconia (SZ), provide excellent corrosion resistance in both extreme acidic and basic environments.
- **Silicon Nitride** provides superior strength and thermal performance for applications that require thermal shock resistance combined with overall material strength. At a lower density than the Zirconia family, it is a lighter weight alternative while still providing excellent strength, corrosion, and wear resistance.

The following tables provide a detailed comparison of the properties and thermal performance of Alumina, Zirconia Toughened Alumina, and Silicon Nitride.

### Alumina - Alumina Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>ASTM Method</th>
<th>Units</th>
<th>Al2O3 95%</th>
<th>Al2O3 96%</th>
<th>Al2O3 98%</th>
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<td>Density</td>
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<td>g/cc</td>
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<td>Hardness</td>
<td>Vickers 500 gm GPa (kg/mm²)</td>
<td>11.5 (11.5)</td>
<td>12.7 (1300)</td>
<td>12.7 (1300)</td>
<td>14.9 (1530)</td>
<td>15 (1530)</td>
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<td>Fracture Toughness</td>
<td>Notched Beam</td>
<td>Mpa·mm¹/²</td>
<td>3 - 4</td>
<td>4 - 5</td>
<td>4 - 6</td>
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<tr>
<td>CTE. 25 - 100°C</td>
<td>C 408</td>
<td>x 10⁵</td>
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<td>Volume Resistivity, 25°C</td>
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<td>&gt; 1 x 10¹⁴</td>
<td>&gt; 1 x 10¹⁴</td>
<td>&gt; 1 x 10¹⁴</td>
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<tr>
<td>Volume Resistivity, 500°C</td>
<td>D 1829</td>
<td>ohms·cm</td>
<td>3 x 10¹⁷</td>
<td>7 x 10¹⁷</td>
<td>2 x 10¹⁷</td>
<td>5 x 10¹⁷</td>
<td>6 x 10¹⁷</td>
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### Zirconia Toughened Alumina - Zirconia Toughened Alumina Properties

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### Silicon Nitride for High Performance with Reduced Weight

Silicon Nitride provides superior strength and thermal performance for applications that require thermal shock resistance combined with overall material strength. At a lower density than the Zirconia materials, it is a lighter weight alternative while still providing excellent strength, corrosion, and wear resistance.
We specialize in providing highly technical, custom solutions for aerospace & defense equipment applications. We are able to offer our customers deep expertise in the specific material properties of given ceramic materials, and matching them to specific use cases. Please contact us to discuss your unique challenges.

Contact Our Applications Engineer With Your Material Questions:

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Applications Engineer, Aerospace & Defense  
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(802) 524-5820