Precision Ceramic Engineering & In-house Manufacturing: A Technical Guide

Organization: Shunda Ceramic (SD) Advanced Materials Co., Ltd.

Core Focus: Custom Alumina (95%–99.8%) & Zirconia Structural Ceramics

Brand Promise: ULTIMATE MATERIAL QUALITY. WORLD-CLASS PRECISION.

Introduction and Material Forming Methodologies

In the demanding landscape of global B2B manufacturing, **Shunda Ceramic (SD)** stands as a premier source for high-performance ceramic components. Located in the **Xinhua Ceramic Industrial Park**-the global hub for electronic ceramics-we combine raw material synthesis with advanced CNC machining to deliver solutions that exceed the limits of traditional metals.

Our core competency lies in the precision control of brittle materials, achieving tolerances ranging from **±0.005 mm to ±0.05 mm**. By utilizing specialized Diamond and Cubic Boron Nitride (CBN) tooling, we prevent micro-cracking and ensure structural integrity in every part.

Ceramic Forming and Shaping Methods (In-house Capabilities)

Before final machining, we process "green" bodies using techniques optimized for density and cost-efficiency:

Forming Method	**Process Description**	**Capabilities & Best For**
Dry Pressing	Powder compacted in rigid dies at high pressure.	**High-volume** simple shapes: **Thermostat discs, spacers, washers.**
Isostatic Pressing	Uniform pressure via fluid through a flexible membrane.	High-density tubes, crucibles, and **large-scale industrial components.**
Extrusion	Powder mixed with binders forced through a die.	Constant cross-sections: **Ceramic rods, heater supports, multi-bore tubes.**
Injection Molding	Powder mixed with organic binders injected into molds.	**Intricate, small parts** with complex geometries in high volumes.
Green Machining	Pre-sintering CNC processing of soft "green" blanks.	Reducing post-sintering costs for **complex custom prototypes.**

Material Matrix and 99.8% Alumina Specifications

The selection of a ceramic material depends on your specific thermal, electrical, and mechanical environment.

Structural Ceramic Material Matrix (Performance Comparison)

Custom material formulations are available upon request to meet specific dielectric or mechanical requirements.

Property	Alumina (95%-99%)	99.8% Alumina (UHP)	Zirconia (ZrO_2)	Steatite (Talc)
Density (g/cm^3)	3.65 - 3.90	**3.93 - 3.98**	6.00	2.70
Hardness (HV)	1500 - 1800	**2000**	1200	800
Thermal Cond. (W/m•K)	20 - 30	**32 - 40**	2 - 3	3
Dielectric Strength (kV/mm)	10 - 15	**≥20**	10	18
Max Working Temp (℃)	1550	**1700**	1100	1000
Cost Advantage	High (Best Value)	**Technical Premium**	Toughness Focus	High (Low Cost)

Technical Specifications: 99.8% Ultra-High Purity Alumina (Shunda Ceramic (SD)-99.8)

Our **Shunda Ceramic (SD)**-99.8 grade is a high-density, alpha-phase crystalline ceramic (Al_2O_3≥99.8%) engineered specifically for mission-critical environments where contamination is not an option. It offers a superior balance of dielectric strength and thermal stability, making it the preferred choice for high-margin, high-tech sectors:

- **Semiconductor & High-Vacuum**: Its fully dense, zero-porosity structure (0% water absorption) prevents outgassing in plasma-resistant chamber parts and wafer processing tools.

- **High-Power LED & Laser Systems**: Exceptional thermal conductivity (32-40 W/m·K) and a mirror-finish polishing capability (5-7 micron grain size) ensure optimal heat dissipation and optical alignment for high-intensity laser housings.

- **Aerospace & Defense**: Superior dielectric strength (≥ 20 kV/mm) and extreme thermal shock resistance (1700℃) provide absolute reliability for high-voltage insulators and hermetic aerospace seals.

- **Medical & Analytical**: Biocompatible and chemically inert, **Shunda Ceramic (SD)**-99.8 maintains exceptional stability against Hydrofluoric and Nitric acids in precision laboratory fluid components.

Technical Deep Dive: Design for Reliability

Designing for ceramics requires a focus on stress management. At Shunda Ceramic (SD), our engineering team works with you to optimize drawings for brittle material success.

Key Design Principles

1. **Stress Management:** Ceramics are vastly stronger in compression. We help redesign tensile loads into compressive loads.
2. **Geometry Optimization:** We recommend radii of **0.5–1.0 mm** on all internal corners to minimize stress concentrations.
3. **Symmetry:** Ensuring even wall thickness to prevent warping during our high-temperature sintering process (1650℃+).

Precision Machining Parameters

To prevent micro-cracking, Shunda Ceramic (SD) employs:

- **Superhard Tooling:** Diamond PCD/CVD exclusively for post-sintered grinding.
- **Precision Cooling:** Meticulous thermal control during grinding to avoid surface damage.
- **Fine Polishing:** Achieving flatness of **1 micron** for specialized sealing components.

Quality Assurance and Professional Services

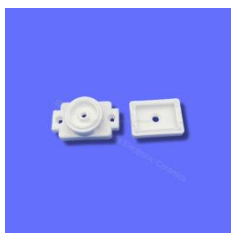
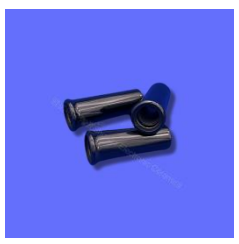
Quality is not just a promise; it is a measurable standard at Shunda Ceramic (SD).

Advanced Quality Control (QC)

We utilize high-end inspection equipment to meet international OEM standards:

- **CMM (Coordinate Measuring Machine):** For 3D spatial verification of complex components.
- **OMM (Optical Measuring Machine):** Non-contact 2D measurement for delicate or micro-sized parts (e.g., **Sensor housings**).
- **100% Inspection:** Available for critical dimensions on mass-produced batches.

Service Categories & Industrial Applications

Category	Case Studies	Targeted Industry Applications
Thermostat Ceramics		High-precision discs and insulators for **Home Appliances.**
Sensor & Probe Parts		Zirconia/Alumina handles and housings for **Automotive & Food Tech.**
Power Electronics		High-voltage insulators and **Terminal blocks.**
Industrial Wear		Custom nozzles, guides, and **Chemical-resistant seals.**

Total Cost of Ownership (TCO) & Global Partnership

Choosing Shunda Ceramic (SD) as your **In-house Manufacturer** means reducing layers of middleman costs. We provide a transparent TCO framework:

1. **Acquisition:** Competitive factory-direct pricing.
2. **Stability:** Consistent batch-to-batch material purity.
3. **Reliability:** Reduced failure rates in the field due to precision QC.

Global Project Consultation

Need a manufacturability review? Send your **STEP, IGES, or PDF** drawings to our team for a professional proposal within 24 hours.

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  Leveraging the supply chain of Xinhua, the World's Electronic Ceramic Capital

  Free Samples Available for Qualified OEM Projects