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Zirconia Ceramic (ZrO_2) — Technical Datasheet

Yttria-stabilized zirconia (Y-TZP) delivers the highest fracture toughness of any technical ceramic (10–15 MPa·m½) with flexural strength above 1,000 MPa, thermal expansion matched to steel, and full chemical inertness. FineCer manufactures custom zirconia components — Y-TZP, Mg-PSZ, Ce-TZP, and CSZ grades, including ISO 13356 implant-grade material — ground to ±0.001 mm with Ra 0.1 µm surfaces, from 1-piece prototypes to volume production.

Key Properties

Property	Value	Notes
Melting Point	2,715°C	Pure ZrO_2 ~2,900°C
Density	5.6–6.1 g/cm³	Y-TZP: ~6.05
Flexural Strength	950–1,500 MPa	Y-TZP exceeds 1,000 MPa
Fracture Toughness	10–15 MPa·m¹/²	Highest among all ceramics
Thermal Conductivity	1.6–2.03 W/(m·K)	1/10th of metals — excellent insulator
Thermal Expansion	10.3 × 10⁻⁶/°C	Close to steel — ideal for metal bonding
Biocompatibility	Excellent	ISO 13356 certified

Grade Comparison

Factor	Y-TZP	Mg-PSZ	Ce-TZP	CSZ
Sintering Temp	1400–1500°C	1700–1800°C	Medium	Medium
Strength	>1000 MPa	Medium	Lower	Lower
Aging Resistance	Moderate	Good	Excellent	—
High-Temp Performance	Moderate	Excellent	Moderate	Good
Cost	Higher	Medium	Lower	Lowest
Primary Use	Dental, bearings	High-temp structure	Toughening agent	Oxygen sensors

Typical Applications

High-pressure pump plungers and sleeves · valve balls, cores and seats · medical and dental components (ISO 13356) · oxygen-sensor elements (CSZ) · wire-drawing and fiber guides · ceramic-to-steel bonded assemblies · wear parts under impact loading.

±0.001 mm tolerance · Ra 0.1 µm finish · MOQ 1 piece · Quote in 24 h · ISO 9001:2015

Values are typical for the material class and are provided for engineering reference only; they are not a guaranteed specification. Actual properties depend on grade, geometry, and process route — the applicable grade and acceptance criteria are confirmed in the quotation and the inspection report shipped with every order. © 2026 FineCer. All data also published at www.finecer.com.