

ZIRCONIUM OXIDE MATERIALS AND COMPONENTS



The core competence of FCT Hartbearbeitungs GmbH, a member of the FCT Group, is the precision machining of hard and ultrahard materials, a service which the company offers to external customers.

FCT Hartbearbeitungs GmbH also produces a wide range of small to large-sized, high-precision ceramic components of complex shapes, made of silicon carbide and zirconium oxide.

Zirconium oxide materials are characterized by:

- their very high mechanical strength and toughness at room temperature
- their excellent wear resistance thanks to the combination of high toughness and hardness
- their high thermal expansion coefficient, comparable to steel (joining)
- their low thermal conductivity
- their suitability for the production of very sharp edges thanks to their small grain size
- their FDA approval for contact with food and drug products
- their limited chemical and hydrothermal resistance: adaptation of their composition can be offered according to the application conditions

FCT Hartbearbeitungs GmbH produces two dense, partially stabilized zirconium qualities, named Y-PSZ and Y-Z20A (ATZ). Both qualities contain Al_2O_3 according to the state of the art to improve hydrothermal resistance: Y-PSZ < 0.5 %, Y-Z20A > 10 %, additional qualities available on request.

ZrO₂ components are produced in diameter up to Ø400 and in length up to 500 mm.

Thanks to our extensive molding and green machining know-how, we are able to produce green bodies close to the final shapes and dimensions while minimizing the need for hard machining processing after the sintering process. This know-how allows us to keep our products fairly cost effective.



Properties of the ZrO₂ materials produced by FCT Hartbearbeitungs GmbH:

Material Property	Zirconia (Part. Y-TZP)	Zirconia (Al ₂ O ₃ -reinforced)
Short description	Y-PSZ	Y-Z20A (ATZ)
Density [g/cm ³]	6,05	5,5
Flexural Strength, RT [MPa] ¹	1000	1200
1000°C	300	400
1350°C	-	-
Weibull-Modulus, RT	≥ 12	≥ 10
Youngs Modulus, RT [GPa]	200	240
Fracture Toughness, [MPa*m ^{1/2}]	10 ^{*(4)}	8 ^{*(4)}
Hardness, HV/HK, [GPa]	12 ^{*(5)}	15 ^{*(5)}
Thermal Expansion, RT-1000°C, [K ⁻¹]	11 * 10 ⁻⁶	9 * 10 ⁻⁶
Thermal Conductivity, RT [W/m*K]	2	5

¹ :4-Pt, 40/20mm

² : SEVNB

³ : HK5

⁴ : VHI-ICL

⁵ : HV10

FCT Hartbearbeitungs GmbH produces prototypes, special parts, and small to medium-sized production series made to customer specifications. We provide our customers competent advice, supported by computer-based analyses like FEM, in connection with the selection of the best suited material and component design to meet ceramic purposes and the most efficient way of production.

The cooperation with our customers is based on reliability, partnership, and trust. It is our challenge to always find the solution that meets your requirements best and to process your orders in the most economically efficient way.

Certified according to DIN EN ISO 9001:2000

Experience and competence in high-tech ceramics
Challenge us – we find solutions