

FCT Zirconia Materials

<i>FCT-Denotation</i>	ZO-S	ZO-HIP	ZO-HR	ZO-AT
Material	Sintered, partial stabilised ZrO ₂	Hot isostatic pressed ZrO ₂	ZrO ₂ with increased hydrolysis resistance	Alumina toughed ZrO ₂ (ATZ)
Process	Pressureless Sintered	Pressureless Sintered / Hot Isostatic Pressed	Pressureless Sintered	Pressureless Sintered / Hot Pressed
Color	White	White	White	White
Geometry	Three-Dimensional / Planar Components	Three-Dimensional / Planar Components	Three-Dimensional / Planar Components	Three-Dimensional / Planar Components
Maximum size	Ø 350 mm, Length 350 mm	Ø 350 mm, Length 350 mm	Ø 350 mm, Length 350 mm	Ø 350 mm, Length 350 mm
Application	Mechanical Engineering, Chemical Plant Engineering, Milling Technology	Mechanical Engineering, Chemical Plant Engineering, Milling Technology	Mechanical Engineering, Chemical Plant Engineering, Milling Technology	Mechanical Engineering, Chemical Plant Engineering

General Properties

Chemical Composition	ZrO ₂	ZrO ₂	ZrO ₂	> 74 % ZrO ₂ / 20 % Al ₂ O ₃
Sinter Additives / Fibre Content	< 5.4 % Y ₂ O ₃	< 5.4 % Y ₂ O ₃	< 5.7 % (Y ₂ O ₃ + Al ₂ O ₃)	< 6 % Y ₂ O ₃
Density ρ [1] (%)	≥ 6.05	≥ 6.08	≥ 6.05	≥ 5.5
Residual Porosity (%)	< 1	< 1	< 1	< 1
Open Porosity Thereof (%)	0	0	0	0
Grain Size (Length) (µm)	< 4	< 4	< 4	< 4

Mechanical Properties

Compressive Strength (MPa)	> 2500	> 2500	> 2500	> 2800
Bending Strength σ RT [2] (MPa)	> 900	> 1400	> 900	> 1200
Bending Strength σ 1000 °C [2] (MPa)	300	400	300	400
Weibull-Modulus m	12	12	12	10
Youngs Modulus E (GPa)	200	200	200	240
Hardness HV [3] (GPa)	12.0	12.0	12.0	15.0
Fracture Toughness K _{IC} [4] (MPam ^{1/2})	10.0	10.0	> 9.0	8.0
Poissons Ratio ν	0.30	0.30	0.30	0.28

Thermal Properties

Maximum Working Temperatures				
- Inert Atmosphere (°C)	800	800	800	800
- Oxidising Atmosphere (°C)	800	800	800	800
Specific Heat Capacity (J/kgK)	2	2	2	5
Thermal Conductivity λ (20°C) (W/mK)				
Coefficient of Thermal Expansion RT-1000 °C (10 ⁻⁶ K ⁻¹)	10.0	11.0	10.0	9.0
RT ± 20 °C (10 ⁻⁶ K ⁻¹)	7.0	8.0	7.0	7.0
Thermal Shock Parameter R ₁ [5] (K)	190	190	300	320
Thermal Shock Parameter R ₂ [6] (W/m)	380	380	600	1.600

Electrical Properties

Electrical Resistivity (RT) Ω cm	> 10 ⁸	> 10 ⁸	> 10 ⁸	> 10 ⁸
Dielectric Constant (1 MHz)	-	-	-	-

RT = Room Temperature

[1] Determination of density and porosity according to DIN 623-2

[2] Average value of 4-point bending strength at room temperature according to DIN EN 843-1

[3] Hardness according to DIN EN 843-4

[4] Calculated from crack length derived from Vickers hardness indentation, according to Niihara

[5] Critical temperature difference for an infinite high heat transfer (quenching)

[6] Thermal shock coefficient at finite constant heat transfer (slowly heating)

Date: October 2019

The material characteristics listed above are measured at testing samples. They cannot be transferred to components with different size, shape or surface properties. We reserve the right to alter properties within the scope of technical progress or new developments.

Further special Zirconia grades are available on demand. We also tailor your specific material solution !