FCT Ingenieurkeramik GmbH

FCT Si_3N_4 Special Materials

FCT-Denotation			SN-PU	SN-TC	SN-EC / SN-ESC	SN-ZO
Material			High Purity Si_3N_4	High Thermal Conductive Si_3N_4	Electrical Conductive / Semi-Conductive Si_3N_4	Low Melt Adhesion / Corrosion-Resistant Si_3N_4
Process			Hot Isostatic Pressed / Hot Pressed	Gas Pressure Sintered / Hot Pressed	Gas Pressure Sintered / Hot Pressed	Gas Pressure Sintered
Color			Grey	Grey / Black	Golden Black	Greyish Silver
Geometry			Three-Dimensional / Planar Components	Three-Dimensional / Planar Components	Three-Dimensional / Planar Components	Three-Dimensional Components
Maximum size			Ø 280 mm, Length 680 mm / Ø 400 mm, Thickness 75 mm	Ø 610 mm, Length 1500 mm / Ø 400 mm, Thickness 75 mm	Ø 610 mm, Length 1500 mm / Ø 400 mm, Thickness 75 mm	Ø 610 mm, Length 1500 mm
Application			Mechanical Engineering, Bearing Applications, Solar and Semiconductor Technology, Chemical Plant Engineering and Construction, Air and Space Applications	Mechanical Engineering, Bearing Applications, Foundry Technology, Solar and Semiconductor Technology, Chemical Plant Engineering and Construction, Air and Space Applications	Mechanical Engineering, Foundry Technology, Chemical Plant Engineering and Construction, Air and Space Applications	Foundry Technology, Chemical Plant Engineering and Construction
General Properties						
Chemical Composition			Si_3N_4	Si_3N_4	Si_3N_4 / TiN	Si_3N_4 / ZrO_2
Sinter Additives / Fibre Content			RE_2O_3 / Al_2O_3	RE_2O_3 / MgO	RE_2O_3 / Al_2O_3	RE_2O_3 / Al_2O_3
Density ρ	[1]	(%)	3.18 – 3.22	3.26 – 3.42	< 4.10 / > 3.55	3.35 – 3.56
Residual Porosity		(%)	< 0.5	< 0.5	< 0.2	< 0.5
Open Porosity Thereof		(%)	0	0	0	0
Grain Size (Length)		(µm)	1 – 10	1 – 10	1 – 10	1 – 15
Mechanical Properties						
Compressive Strength		(MPa)	3000	3000	3000	3000
Bending Strength σ RT	[2]	(MPa)	870 – 980	750 – 1020	720 / 690	540 – 580
Weibull-Modulus m			10 – 15	> 12	> 12	25
Youngs Modulus E		(GPa)	320	300 – 310	340 / 320	190 – 290
Hardness HV	[3]	(GPa)	15.3	14.7 – 15.6	14.6 / 15.2	13 – 15
Fracture Toughness K_{Ic}	[4]	($MPam^{1/2}$)	6.5 – 5.6	8.1 – 6.4	6.0	5.8 – 6.3
Poissons Ratio ν			0.26	0.26	0.26	0.26
Thermal Properties						
Maximum Working Temperatures						
– Inert Atmosphere		(°C)	1500	1500	1000	1200
– Oxidising Atmosphere		(°C)	1300	1300	800	1400
Specific Heat Capacitiy		(J/kgK)	660	630	620	–
Thermal Conductivity λ (20°C)		(W/mK)	24	65 – 52	21	25
Coefficient of Thermal Expansion	RT-1000 °C	($10^{-6}K^{-1}$)	3.2	3.3	4.7	3.2
	RT- 250 °C	($10^{-6}K^{-1}$)	1.6	1.7	2.3 / 2.1	1.9
	RT ± 20 °C	($10^{-6}K^{-1}$)	1.3	1.4 – 1.5	2.1 / 1.9	1.5 – 1.6
Thermal Shock Parameter R_1	[5]	(K)	670 – 760	600 – 740	360 / 380	460 – 660
Thermal Shock Parameter R_2	[6]	(W/m)	16100 – 18200	39000 – 38400	7600 / 7900	11560 – 16430
Electrical Properties						
Electrical Resistivity (RT)		Ωcm	–	–	10^{-5} – 10^{1} / 10^{4}	–
Dielectric Constant (1 MHz)		–	8	8	–	–

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 characterisitics listed above are measured at testing samples. They cannot be transfered 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 Si_3N_4 grades are available on demand. We also tailor your specific material solution !

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