FCT Ingenieurkeramik GmbH

Material Data of different Ceramics and Metals

			Ceramic Materials										Metals				
Material			GPSN	HPSN	HIPSN	SSiC	LPSiC	SiSiC	C/C-SiC	Graphit	AlN	Al_2O_3	ZrO_2	Steel	Cast Iron	WC/Co	TiAl6V4	AlCuMgSi
Material Grade/Material Number			–	–	–	–	–	–	–	–	–	99,8 %	Y-TZP	1.3505	0.6025	K20	3.7165	1.1324
FCT-Denotation			SN-GP	SN-HP	SN-HIP	SC-S	KAMe®	–	SC-CF	–	–	–	ZO-S	–	–	–	–	–
General Properties																		
Density ρ	[1]	(%)	3.18 – 3.40	3.18 – 3.41	3.18 – 3.26	> 3.10	> 3.22	41458	1.9 – 2.3	1.8	3.3	3.95	≤ 6.05	7.8	7.2	14.75	4.43	2.8
Residual Porosity		(%)	< 1	< 0.5	< 0.2	< 3	< 0.1	< 1	< 5	10 – 15	< 1	< 1	< 1	0	< 1	0	0	0
Open Porosity Thereof		(%)	0	0	0	0	0	0	< 0.5	–	–	–	–	0	–	0	0	0
Grain Size (Length)		(µm)	1 – 15	1 – 10	1 – 15	1 – 10	1 – 2	–	–	–	–	–	4	–	–	2	–	–
Mechanical Properties																		
Compressive Strength		(MPa)	3000	3000	3000	> 3000	3000	1000	–	120	2100	≥ 3.000	> 2500	750	1000	4700	970	410
Bending Strength σ RT	[2,3]	(MPa)	730	970	760 – 830	450	500	340	70 – 200	60	> 300	370	> 900	750	300	2500	895	410
Weibull-Modulus m			18	20	12	> 12	15	10	–	–	> 10	6	12	–	50	20	–	–
Youngs Modulus E		(GPa)	300	300	300 – 310	400	410	380	27 – 40	10	310	370	200	207	120	550	114	72
Hardness HV	[4]	(GPa)	15.0	15.0	15.0 – 15.6	22.0	20	–	–	–	11	20	12	8.2	2	17	3.9	1.6
Fracture Toughness K_{ic}	[5]	($MPam^{1/2}$)	7.0	6.2	6.5 – 6.2	3.0	> 5	4	9.5	–	3.4	4.5	10	100	20	9.3	–	–
Poissons Ratio ν			0.26	0.26	0.26	0.16	0.19	0.17	–	0.2	0.22	0.23	0.3	0.33	0.25	0.23	0.31	0.33
Thermal Properties																		
Maximum Working Temperatures																		
– Inert Atmosphere		(°C)	1400	1400	1400	1900	1600	1400	1600	2400	1000	1700	800	400	450	1.000	350	150
– Oxidising Atmosphere		(°C)	1200	1200	1200	1600	1500	1400	600	500	1000	1700	800	400	350	700	350	150
Specific Heat Capacitiy		(J/kgK)	700	700	700	670	–	–	–	–	740	775	–	–	–	–	526	875
Thermal Conductivity λ (20°C)		(W/mK)	25	24	25	125	90	120	11	100	180	28	2	33	30	80	6,8	134
Coefficient of Thermal Expansion	RT-1000 °C	($10^{-6}K^{-1}$)	3.2	3.2	3.2	4.6	4.9	4.9	–	3 – 4	5.6	8	10	13.4	11	5.5	–	–
	RT- 250 °C	($10^{-6}K^{-1}$)	1.9	1.9	1.9	3.3	3.3	3.4	2.5	–	3.6	7	–	–	–	5	9	25.4
	RT ± 20 °C	($10^{-6}K^{-1}$)	1.4	1.4	1.3	2.5	2.5	–	–	–	–	–	7	–	–	–	–	–
Thermal Shock Parameter R_1	[6]	(K)	558	748	> 600	205	202	152	–	1400	130	90	190	–	170	636	602	150
Thermal Shock Parameter R_2	[7]	(W/m)	13955	17945	> 15000	25679	18143	18187	–	137100	23400	2520	380	–	5114	50909	4093	20128
Electrical Properties																		
Electrical Conductivity (RT)		Ωcm	10^{14}	10^{14}	10^{14}	10^{7}	–	–	–	10^{14}	$> 10^{12}$	10^{14}	10^{8}	0.001	0.01	0.01	$1.7 \cdot 10^{-4}$	$5.2 \cdot 10^{-6}$
Dielectric Constant (1 MHz)		–	8	8	8	–	–	–	–	–	8,6	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] Metals: tensile strength (R_m) values are presented for comparison
[4] Hardness according to DIN EN 843-4
[5] Calculated from crack length derived from Vickers hardness indentation, according to Niihara
[6] Critical temperature difference for an infinite high heat transfer (quenching)
[7] Thermal shock coefficient at finite constant heat transfer (slowly heating)

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.

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