General Properties of Ceramic Raw Materials

Comparison with Standard Materials

Materials	Aluminium oxide	Zirconium oxide	Silicon nitride	Silicon carbide
Chemical formula	Al_2O_3	ZrO_2	Si_3N_4	**SiC**
Properties				
Bending and tensile strength		high		
Density			low	low
Impact strength	high			
E modulus		small (like steel)		
Strength at high temperatures			high	high
Frictional properties				very good
Hardness	high			very high
Corrosion resistance	good			
Conductivity	electrical insulator			semiconductor properties
Tear strength		high	high	
Thermal shock resistance			yes	yes
Tribological properties		good		
Wear resistance	high			
Expansion coefficient		high	low	low
Thermal conductivity		low	medium	very high

Physical Properties of Ceramic Raw Materials

Comparison with Standard Materials

Material	Unit	Aluminium oxide		Zirconium oxide		Silicon carbide	Silicon nitride
Chemical formula		Al_2O_3	Al_2O_3	ZrO_2 - TZP	ZrO_2 - ATZ	SSiC	SSN
Zusammensetzung		99.7%	99.9%	95% ZrO_2 5% Y_2O_3	76% ZrO_2 20% Al_2O_3 4% Y_2O_3		
Colour		ivory	withe	withe	withe	black	grey
Mechanical Properties							
Density	g/cm³	3.85	3.98	6.05	5.5	3.1	3.24
Vickers hardness	HV100	1‘800 - 2‘300	2‘100	1‘200	1‘400	2‘550	1‘400
Impact strength	MPa	2‘800	3‘800	2‘000	2‘000	2‘200	2‘500
Bending strength	MPa	300	500	1‘000	2‘000	400	700
Brittleness	$MPam^{1/2}$	-	4.0	8.0	8.0	4.0	7.0
Elsatic module	GPa	300	380	200	220	410	300
Thermal Properties							
- in protective gas	°C	1‘600	1‘900	1‘000	1‘000	1‘800	1‘300
- in air	°C	1‘600	1‘900	1‘000	1‘000	1‘500	1‘100
Specific conductivity at 20°C	J/Kg K	900	900	500	600	600	700
Thermal conductivity from 20 - 100°C	W/mK	19 - 30	30	2.5	6	125	25
Expansion coefficient (between 20°C and 1000°C)	10^{-6}	9.0	8.0	10.0	9.0	4.1 / 5.2	2.0 / 4.0
Resistance to temperature change	K	100	190	300	300	350	450
Electrical Properties							
Specific resistance at 20°C	Ωcm	$5 \cdot 10^{12}$	10^{14}	-	-	10^6-10^8	10^{11}

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