

Materials characteristics

Material Units		Alumina 96%	Alumina 99.7%	Alumina 99.9%	ZTA 90%Al ₂ O ₃ / 10% 3Y-TZP	APTZNA 75% TZP / 25% Al ₂ O ₃	APTZHT 85% TZP / 15% Al ₂ O ₃	ATZ 80% 3Y-TZP / 20% Al ₂ O ₃	Zirconia 3Y-TZP	Zirconia 1Mg-PSZ	Zirconia Ce-TZP	Sapphire/ruby	Silicon Carbide SiC	Silicon nitride Si ₃ N ₄ -Y ₂ O ₃	Alumina 99.9%	Zirconia 3Y-TZP	ATZ 80% 3Y-TZP / 20% Al ₂ O ₃	Polycrystalline Ruby
		HIP	HIP	HIP	HIP	HIP	HIP	HIP	HIP	HIP	HIP	HIP	HIP	HIP	HIP	HIP	HIP	HIP
General																		
density	g.cm ⁻³	3.75	3.85	3.95	4.13	5.40	5.70	5.40	6.06	5.74	6.2	3.99	3.1	3.21	3.97	6.07	5.43	3.99
water adsorption	%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas permeability	%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Color	-	white	Ivory	Ivory-white	white	brown	brown	white	white/black	Orange	light yellow	transparent/red	black	Grey	translucent	white	white	Rubis
Structure	-	Polycrystal	Polycrystal	Polycrystal	Polycrystal	Polycrystal	Polycrystal	Polycrystal	Polycrystal	Polycrystal	Polycrystal	Monocrystal	Polycrystal	Polycrystal	Polycrystal	Polycrystal	Polycrystal	Polycrystal
Average Grain size	µm	4±1	4±2	3±1	3±1	0.5±0.1	0.5±0.1	0.5±0.1	0.5±0.1	20±5	1±0.5	-	-	-	3±1	0.5±0.1	0.5±0.1	3±1
Mechanical																		
Bending strenght 20°C	MPa	300	400	500	600	1000	1000	1000	1200	400	600	200	400	850	550	1700	1600	600
Weibull modulus	-	13	14	15	17	15	15	15	10	25	10		12	16	16	18	15	
Compression strenght	MPa	2500	3500	4000	4000	2500	2500	2500	2200	1600	2000	2000	2000	3000	4000	2000	2500	4000
K1c	MPa.m ^{1/2}	4	4	4	5	6	12	5	8	8	8		4	7	5	9	5	4
Young modulus	GPa	350	400	400	380	250	250	250	210	210	200	400	400	300	400	210	250	400
Poisson ratio	-	0.23	0.23	0.23	0.25	0.26	0.26	0.26	0.3	0.3	0.25		0.15	0.25	0.23	0.3	0.26	0.23
Hardness Vickers	Hv	1500	1700	1900	1800	1300	1200	1400	1200	1200	800	2000	2200	1600	1900	1300	1400	2000
Thermal																		
Conductivity 20°C	W.m ⁻¹ .k ⁻¹	20	25	30	20			10	2.5	3	3.5		100	20	30	2.5	10	30
conductivity 1000°C	W.m ⁻¹ .k ⁻¹																	
Linear thermal expansion coefficient																		
20-100°C	10 ⁻⁶ .k ⁻¹																	
20-400°C	10 ⁻⁶ .k ⁻¹	7.6	7.5	7.5	8			9	10	10	9	6	3.5	3.2	7.5	10	9	7.5
20-600°C	10 ⁻⁶ .k ⁻¹																	
20-1000°C	10 ⁻⁶ .k ⁻¹	8.8	8.7	8.5					11.7	11	10		5	4.3	8.5	11.7		8.5
Specific heat 20°C	kJ.kg ⁻¹ .k ⁻¹	0.9	0.9	0.9	0.9			0.5	0.4	0.4		0.4	0.6	0.7	0.9	0.4	0.5	0.9
Temperature max oxygen	°C	1200	1500	1500	1000	1000	1000	1000	1000	850	500	1500	1400	1300	1500	1000	1000	1000
inert	°C	1200	1500	1500	1000	1000	1000	1000	1000	850	500	1500	1800	1600	1500	1000	1000	1000
Electrical																		
Resistivity 25°C	Ω.cm	1.10 ¹⁵	1.10 ¹⁴	5.10 ¹⁴	1.10 ¹⁴				1.10 ¹²	5.10 ¹²	1.10 ¹³	1.10 ⁹	5.10 ⁷	1.10 ¹⁴	5.10 ¹⁴	1.10 ¹²		
Résistivity 400°C	Ω.cm	1.10 ⁸	5.10 ⁸	5.10 ⁸	1.10 ⁹				1.10 ⁴	1.10 ⁵	1.10 ⁶		1.10 ¹	1.10 ¹⁰	5.10 ⁸	1.10 ⁴		
Dielectric strength	kV.mm ⁻¹	17	18	19					19	19	25		0	19	19	19		
Dielectric constant	-	8 (1MHz)	9 (1MHz)	9 (1MHz)	10 (1MHz)				29 (1MHz)	27 (1MHz)	30 (1MHz)			8 (1MHz)	9 (1MHz)	29 (1MHz)		
tan δ	-	5.10 ⁻³ (9GHz)	5.10 ⁻³ (9GHz)	5.10 ⁻³ (9GHz)					2.10 ⁻³ (1GHz)	2.10 ⁻³ (1GHz)	1.10 ⁻³ (1MHz)		4.10 ⁻³ (1GHz)		5.10 ⁻³ (9GHz)	2.10 ⁻³ (1GHz)		
Note								No aging	Shock resistant									