

Material Characteristics

Alumina (Ceramaret ref.)	0102100A	0101400A	0101600A	0101200A
Type	Alumina 99.99%	Alumina 99.7%	Alumina 96%	ZTA Composite
Material	Al ₂ O ₃	Al ₂ O ₃	Al ₂ O ₃	90%Al ₂ O ₃ / 10%ZrO ₂

Chemical

MgO (%)	0,0285 – 0,0315	0.08		0.045
SiO ₂ (%)	<0.0025	0.06		0.006
Fe ₂ O ₃ (%)	<0.0015	0.02		0.002
Na ₂ O (%)	<0.0035	0.10	0.1	0.001
K ₂ O (%)		-	-	0.001
Y ₂ O ₃ (%)		-	-	0.520
TiO ₂ (%)		-	-	0.010

Physical

Color	light cream	cream	white	cream
Crystalline structure	Hexagonal	Hexagonal	Hexagonal	Hexa./Tetra.
Grain size (microns)	3			2 – 0,7
Final density (g/cm ³)	3.92	3.90	3.74 – 3.80	3.90

Mechanical

Bending strength σ (MPa)	600	400	500	650
Hardness Hv500g (GPa)	18.5	17	15	18
Traction resistance (MPa)	200 - 250	320	240	
Compression resistance (MPa)	1900 - 2000	4000	3000	
Shear resistance (MPa)				
Young modulus (GPa)	~380	300	280	
Shear modulus (GPa)				
Poisson ratio (-)	0.25 – 0.30			
Toughness K _{1c} (MPa.m ^{1/2})		4 - 5	4	

Thermal

Thermal expansion coef. (./°K)	8.40x 10 ⁻⁶	7.5 x 10 ⁻⁶	7-7.5 x 10 ⁻⁶	
Spécific heat (at 100°C) (J/kg.°K)	930	850-1050	850-1050	
Thermal conductivity (at 20°C) (W/m.°K)	40	20-25	18-23	
Thermal shock resistance (°C)	200			
Max. working temperature		1500°C	1200-1400°C	

Electrical

Resistivity (at 20°C) (Ohm.cm)		6 x 10 ¹⁴	7,5 x 10 ¹⁶	
Dielectric constant at 20°C and 1 GHz (-)		9,6	9,2	
Tan δ at 20°C and 100 MHz (-)		3 x 10 ⁻³	1 x 10 ⁻³	
Dielectric strength à 50 Hz (kV/mm)		17	15	

Zirconia (Ceramaret ref.)

0201200A 0201200A HIP 0201900A HIP 0200100A HIP 0200400A HIP

Type	Zirconia A	Zirconia AH	Zirconia BH	Zirconia DH	ATZ Composite H	Mg-PSZ
Material	ZrO ₂ (3Y-TZP)	ZrO ₂ (3Y-TZP)	ZrO ₂ (3Y-TZP)	ZrO ₂ (3Y-TZP)	80%ZrO ₂ / 20%Al ₂ O ₃	ZrO ₂ (Mg-PSZ)

Chemical

Y ₂ O ₃ (wt%)	5.25	5.25	4 - 6	5.4	4	-
Al ₂ O ₃ (wt%)	0.25	0.25	-	0.3	21.1	0.02
HfO ₂ (wt%)	< 2	< 2	< 2	<2	< 2	< 2
SiO ₂ (wt%)	0.006	0.006	-	0.15	0.02	0.2
Fe ₂ O ₃ (wt%)	0.01	0.01	-	0.01	0.01	0.09
Na ₂ O (wt%)	0.04	0.04	-	0.05	0.04	-
MgO (wt%)	-	-	-	-	-	3.65
TiO ₂ (wt%)	-	-	-	0.15	-	0.01

Physical

Color	white	white	black	white	white	yellow
Crystalline structure	Tetragonal	Tetragonal		Tetragonal	Tétrag./Hexag.	Cubic/tetra/ monoclic
Grain size (microns)	0.5	0.5	0.7	0.7		10 - 20
Final density (g/cm ³)	6.05	6.05	6.00	6.05	5.5	5.67

Mechanical

Bending strength σ (MPa)	1300	1600	1330		1600	500
Hardness Hv500g (GPa)	14.5	14.5	12.7	14.5	16.0	11.5
Traction resistance (MPa)	200 - 250	200 - 250		200 - 250	-	
Compression resistance (MPa)	2000 - 3000	2000 - 3000		2000 - 3000	-	
Shear resistance (MPa)					-	
Young modulus (GPa)	200	200		210	260	
Shear modulus (GPa)	69	69		69	69	
Poisson ratio (-)	0.3	0.3		0.31	0.3	
Toughness K _{1c} (MPa.m ^{1/2})	5	5		5	5	

Thermal

Thermal expansion coef. (./°K)	10 x 10 ⁻⁶	10 x 10 ⁻⁶		11 x 10 ⁻⁶	9.4 x 10 ⁻⁶	
Spécific heat (at 100°C) (J/kg.°K)	450 - 500	450 - 500		460	450 - 500	
Thermal conductivity (at 20°C) (W/m.°K)	2.5	2.5		3	2.5	
Thermal shock resistance (°C)	470	470		300	470	
Max. working temperature	1000	1000		1000	1000	1000

Electrical

Resistivity (at 20°C) (Ohm.cm)	6,7 x 10 ¹²	6,7 x 10 ¹²		1,2 x 10 ¹³		
Dielectric constant at 20°C and 1 GHz (-)	32,5	32,5		31,5		
Tan δ at 20°C and 100 MHz (-)	1,5 x 10 ⁻³	1,5 x 10 ⁻³		7,5 x 10 ⁻³		
Dielectric strength à 50 Hz (kV/mm)	30 - 40	30 - 40		30 - 40		

Note: The values quoted are typical. Ceramic property values can vary with the method of manufacture