



Ceramic Properties Standard

			Alumina										Zirconia				Carbides					
			Porcelain	Mullite	AD-85	AD-90	AD-94	AD-96	FG-995	AD-995	AD-998	PlasmaPure-UC™ Alumina	ZTA	DURA-Z™ (TTZ)	YTZP (Sintered)	YTZP (HIPed)	SC-RB (SC-2)	UltraSiC™ (SC-30)	WC	PureSiC® HR	PureSiC® LR	
					Nom. 85% Al ₂ O ₃	Nom. 90% Al ₂ O ₃	Nom. 94% Al ₂ O ₃	Nom. 96% Al ₂ O ₃	Nom. 98.5% Al ₂ O ₃	Nom. 99.5% Al ₂ O ₃	Min. 99.8% Al ₂ O ₃	Min. 99.9% Al ₂ O ₃	Zirconia-Toughened Alumina	MgO Partially Stabilized Zirconia	Y ₂ O ₃ Partially Stabilized Zirconia	Y ₂ O ₃ Partially Stabilized Zirconia	Reaction Bonded Silicon Carbide	Direct Sintered Silicon Carbide	Tungsten Carbide	CVD Silicon Carbide > 99.9995%	CVD Silicon Carbide > 99.9995%	
Properties*	Units	Test																				
Density	gm/cc	ASTM-C20	2.40	2.80	3.42	3.60	3.70	3.72	3.80	3.90	3.92	3.92	4.01	5.72	6.02	6.07	3.10	3.15	14.90	3.21	3.21	
Crystal Size	Average	MICRONS	THIN-SECTION	–	10	6	4	12	6	6	6	3	2	35	1	1	12	5	2	3 - 10	3 - 10	
Water Absorption	%	ASTM-373	0	0	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	0	
Color	–	–	WHITE	TAN	WHITE	WHITE	WHITE	WHITE	WHITE	IVORY	IVORY	IVORY	WHITE	IVORY	IVORY	GREY	BLACK	BLACK	GRAY	BLACK	BLACK	
Flexural Strength (MOR)	20° C	MPa (psi x 10 ³)	ASTM-F417	130 (19)	170 (25)	296 (43)	338 (49)	352 (51)	358 (52)	375 (54)	379 (55)	375 (54)	400 (58)	450 (65)	900 (130)	1240 (180)	1720 (250)	462 (67)	480 (70)	1550 (225)	468 (68)	517 (75)
Elastic Modulus	20° C	GPa (psi x 10 ⁴)	ASTM-C848	104 (15)	150 (22)	221 (32)	276 (40)	303 (44)	303 (44)	350 (51)	370 (54)	370 (54)	386(56)	360 (52)	200 (29)	210 (30)	210 (30)	393 (57)	410 (59)	627 (91)	462 (67)	434 (63)
Poisson's Ratio	20° C	–	ASTM-C848	–	–	0.22	0.22	0.21	0.21	0.22	0.22	0.22	0.23	0.30	0.23	0.23	0.20	0.21	–	0.21	0.21	
Compressive Strength	20° C	MPa (psi x 10 ³)	ASTM-C773	590 (86)	550 (80)	1930 (280)	2482 (360)	2103 (305)	2068 (300)	2500 (363)	2600 (377)	2500 (363)	2700 (392)	2900 (421)	1750 (254)	2500 (363)	2500 (363)	2700 (363)	3500 (507)	5000 (725)	–	–
Hardness			KNOOP 1000 gm	5.9 (600)	7.4 (750)	9.4 (960)	10.4 (1058)	11.5 (1175)	11.5 (1175)	13.7 (1400)	14.1 (1440)	14.1 (1440)	14.5 (1480)	14.4 (1475)	11.8 (1200)	12.7 (1300)	12.7 (1300)	26 (2500)	26 (2800)	16 (1630)	27 (2750)	27 (2750)
				R45N	ROCKWELL 45 N	60	70	73	75	78	78	82	83	83	86	85	77	81	81	–	–	–
Tensile Strength	25° C	MPa (psi x 10 ³)	ACMA TEST #4	–	–	155 (22)	221 (32)	193 (28)	221 (32)	248 (36)	262 (38)	248 (36)	283 (41)	290 (42)	483 (70)	–	–	307 (44.5)	–	–	–	–
Fracture Toughness	K(I c)	Mpa m ^{1/2}	NOTCHED BEAM	2	2	3 - 4	3 - 4	4 - 5	4 - 5	4 - 5	4 - 5	4 - 5	4 - 5	5 - 6	11	13	13	4	4	> 6	3.5	3.5
Thermal Conductivity	20° C	W/m K	ASTM-C408	5.0	3.5	16.0	16.7	22.4	24.7	27.5	30.0	30.0	35.0	27.0	2.2	2.2	2.2	125.0	150.0	100.0	115.0	115.0
Coefficient of Thermal Expansion	25-1000° C	1X 10 ⁻⁶ /°C	ASTM-C372	4.9	5.3	7.2	8.1	8.2	8.2	8.2	8.2	8.2	8.1	8.3	10.2	10.3	10.3	4.3	4.4	5.1	4.6	4.6
Specific Heat	100° C	J/kg*K	ASTM-E1269	–	950	920	920	880	880	880	880	880	870	885	400	400	400	800	800	–	665	665
Thermal Shock Resistance	Δ Tc	°C	NOTE 3	–	300	300	250	250	250	200	200	200	200	300	350	350	350	400	300	–	–	–
Maximum Use Temperature		°C	NO-LOAD COND.	1400	1700	1400	1500	1700	1700	1700	1750	1750	1750	1500	500	1500	1500	1000	1600	1000	1600	1600
Dielectric Strength		ac-kV/mm (ac V/mil)	ASTM-D116	–	9.8 (248)	9.4 (240)	8.3 (210)	8.3 (210)	8.3 (210)	8.7 (220)	8.7 (220)	8.7 (220)	8.7 (220)	9.0 (228)	9.4 (240)	9.0 (228)	9.0 (228)	–	–	–	–	–
Dielectric Constant	1 MHz	25° C	ASTM-D150	5.9	6.0	8.2	8.8	9.1	9	9.6	9.7	9.8	9.8	10.6	28.0	29.0	29.0	–	–	–	–	–
Dielectric Loss (tan delta)	1 MHz	25° C	ASTM-D150	0.0024	0.002	0.0009	0.0004	0.0004	0.0002	0.0002	0.0001	0.0001	<0.0001	0.0005	0.001	0.001	0.001	–	–	–	–	–
Volume Resistivity	25° C	ohm-cm	ASTM-D1829	–	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁵	> 10 ¹⁴	> 10 ¹³	> 10 ¹³	> 10 ¹³	< 10 ³	< 10 ⁵	< 10 ³	> 10 ⁶	< 0.10
	500° C	ohm-cm	ASTM-D1829	–	5 x 10 ¹²	4 x 10 ⁸	4 x 10 ⁸	4 x 10 ⁹	4 x 10 ⁹	2 x 10 ¹⁰	2 x 10 ¹⁰	2 x 10 ¹⁰	1 x 10 ¹²	2 x 10 ⁹	2 x 10 ⁵	2 x 10 ⁴	2 x 10 ⁴	< 10 ³	< 10 ³	< 10 ³	–	–
	1000° C	ohm-cm	ASTM-D1829	–	3 x 10 ⁵	–	5 x 10 ⁵	5 x 10 ⁵	1 x 10 ⁶	2 x 10 ⁶	2 x 10 ⁶	2 x 10 ⁷	1 x 10 ⁷	3 x 10 ⁶	< 10 ³	< 10 ³	< 10 ³	< 10 ³	< 10 ³	< 10 ³	–	–
Impingement	–	NOTE 4	–	–	1.00	0.45	0.52	0.50	0.48	0.47	0.47	0.47	0.41	0.63	0.20	0.20	0.14	0.12	0.12	0.03	0.02	
Rubbing	–	NOTE 4	–	–	1.00	0.36	–	0.60	–	–	–	–	0.49	0.57	0.20	0.20	–	–	–	–	–	

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