COORSTEK
Amazing Solutions®

Ceramic Properties Standard

	Properties*		Units	Test	Porcelain	Mullite	AD-85	AD-90	AD-94	AD-96	FG-995	AD-995	AD-998	PlasmaPure™	ZTA	DURA-Z™ (TTZ)	YTZP (Sintered)	YTZP (Hipped)	SC-NB	SC-RB (SC-2)	UltraSiC™ (SC-30)	WC	PureSiC® HR	PureSiC® LR
							Alumina								Zirconia				Carbides					
							Nom. 85% Al_2O_3	Nom. 90% Al_2O_3	Nom. 94% Al_2O_3	Nom. 96% Al_2O_3	Nom. 98.5% Al_2O_3	Nom. 99.5% Al_2O_3	Nom. 99.8% Al_2O_3	Nom. 99.8% Al_2O_3	Zirconia-Toughened Alumina	MgO Partially Stabilized Zirconia	Y_2O_3 Partially Stabilized Zirconia	Y_2O_3 Partially Stabilized Zirconia	Nitride Bonded Silicon Carbide	Reaction Bonded Silicon Carbide	Direct Sintered Silicon Carbide	Tungsten Carbide	Deposition (CVD) Silicon Carbide > 99.9995%	Deposition (CVD) Silicon Carbide > 99.9995%
MECHANICAL	Density		gm/cc	ASTM-C20	2.40	2.80	3.42	3.60	3.70	3.72	3.80	3.90	3.92	3.93	4.01	5.72	6.02	6.07	2.60	3.10	3.15	14.90	3.21	3.21
	Crystal Size	Average	MICRONS	THIN-SECTION	–	10	6	4	12	6	6	6	6	6	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	8	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	IVORY	GRAY	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)	758 (110)	1240 (180)	1720 (250)	48 (7)	462 (67)	480 (70)	1550 (225)	468 (68)	517 (75)
	Elastic Modulus	20° C	GPa (psi x 10^6)	ASTM-C848	104 (15)	150 (22)	221 (32)	276 (40)	303 (44)	303 (44)	350 (51)	370 (54)	370 (54)	370 (54)	360 (52)	200 (29)	210 (30)	210 (30)	152 (22)	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	0.22	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)	2680 (390)	2900 (421)	1750 (254)	2500 (363)	2500 (363)	140 (20)	2700 (363)	3500 (507)	5000 (725)	–	–
	Hardness		GPa (kg/mm²)	KNOOP 1000 gm ROCKWELL 45 N	5.9 (600) 60	7.4 (750) 70	9.4 (960) 73	10.4 (1058) 75	11.5 (1175) 78	11.5 (1175) 78	13.7 (1400) 82	14.1 (1440) 83	14.1 (1440) 83	14.1 (1440) 83	14.4 (1475) 85	11.8 (1200) 77	12.7 (1300) 81	12.7 (1300) 81	– –	26 (2500) –	26 (2800) –	16 (1630) –	27 (2750) –	27 (2750) –
	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)	275 (40)	290 (42)	352 (62)	–	–	–	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	Thermal Conductivity	100° C	W/m °K	ASTM-C408	5.0	3.5	16.0	16.7	22.4	24.7	27.5	30.0	30.0	30.0	27.0	2.2	2.2	2.2	80.0	125.0	150.0	100.0	115.0	115.0
	Coefficient of Thermal Expansion	25-1000° C	1 X 10^{-6}/°C	ASTM-C372	4.9	5.3	7.2	8.1	8.2	8.2	8.2	8.2	8.2	8.2	8.3	10.2	10.3	10.3	3.9	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	880	885	400	400	400	–	800	800	–	665	665
	Thermal Shock Resistance	ΔTc	°C	NOTE 3	–	300	300	250	250	250	200	200	200	200	300	350	350	350	400	400	300	–	–	–
	Maximum Use Temperature		°C	NO-LOAD COND.	1400	1700	1400	1500	1700	1700	1700	1750	1750	1750	1500	500	1500	1500	1600	1000	1600	1000	1600	1600
ELECTRICAL	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	0.0020	0.0009	0.0004	0.0004	0.0002	0.0002	0.0001	0.0001	< 0.0001	0.0005	0.0010	0.0010	0.0010	–	–	–	–	–	–
	Volume Resistivity	25° C	ohm-cm	ASTM-D1829	–	$> 10^{14}$	$> 10^{14}$	$> 10^{14}$	$> 10^{14}$	$> 10^{14}$	$> 10^{14}$	$> 10^{14}$	$> 10^{14}$	$> 10^{14}$	$> 10^{14}$	$> 10^{13}$	$> 10^{13}$	$> 10^{13}$	–	$< 10^3$	$< 10^5$	$< 10^3$	$> 10^6$	< 0.10
		500° C	ohm-cm	ASTM-D1829	–	5×10^{12}	4×10^8	4×10^8	4×10^9	4×10^9	2×10^{10}	2×10^{10}	2×10^{10}	1×10^{11}	2×10^9	2×10^5	2×10^4	2×10^4	–	$< 10^3$	$< 10^3$	$< 10^3$	–	–
		1000° C	ohm-cm	ASTM-D1829	–	3×10^5	–	5×10^5	5×10^5	1×10^6	2×10^6	2×10^6	2×10^7	3×10^6	3×10^6	$< 10^3$	$< 10^3$	$< 10^3$	–	$< 10^3$	$< 10^3$	$< 10^3$	–	–
WEAR	Imprignement		–	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	–	–	–	–	–	–

The chart is intended to illustrate typical properties. Engineering data is representative. Property values vary somewhat with method of manufacture, size, and shape of part. Any suggested applications are not made as a representation or warranty that the material will ultimately be suitable for such applications. The customer is ultimately responsible for all design and material suitability decisions. Data contained herein is not to be construed as absolute and does not constitute a representation or warranty for which CoorsTek assumes legal responsibility. ANY WARRANTY OR REPRESENTATION FOR WHICH COORSTEK IS RESPONSIBLE SHALL BE SUBJECT TO A SEPARATELY NEGOTIATED AGREEMENT.

Notes:
1. Data Measurements – All data measurements are typical and made at room temperature unless otherwise noted.

2. Composition Control – all CoorsTek ceramic compositions are controlled using modern chemical, spectrographic, and X-ray fluorescent methods.

3. Thermal Shock Resistance – Tests are run by quenching samples into water from various elevated temperatures. The change in temperature where a sharp decrease in flexural strength is observed is listed as ΔTc.

4. Wear Resistance – Impingement tests are run using a dry fused alumina abrasive. Rubbing tests are run using a dry 240 grit fused alumina abrasive. The indices in the chart are calculated by dividing the material volume loss by the volume loss of an AD-85 alumina control. The lower in the index, the better the wear resistance.

*Ceramic property values vary somewhat with method of manufacture, size, and shape of part. Close control of values of most properties can be maintained if specified.

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