

MATERIAL PROPERTIES STANDARD 2000

Properties *	Units	Test	Porcelain	Mullite	ALUMINA							ZIRCONIA				CARBIDE			
					AD-85	AD-90	AD-94	AD-96	FG-995	AD-995	AD-998	AZ-25	ZTA	TTZ	YTZP	SCNB	SCRB	SC-30	WC
			3Al ₂ O ₃ • 2SiO ₂	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	Nom. 99.8% Al ₂ O ₃	Alumina-Zirconia Composite	Zirconia-Toughened Alumina	MgO Partially Stabilized Zirconia	Y ₂ O ₃ Partially Stabilized Zirconia	Nitride Bonded Silicon Carbide	Reaction Bonded Silicon Carbide	Direct Sintered Silicon Carbide	Tungsten Carbide	
Density	gms/cc	ASTM-C20	2,40	2,80	3,42	3,60	3,70	3,72	3,80	3,90	3,92	3,82	4,05	5,72	6,02	2,60	3,10	3,15	14,90
Crystal Size Average	MICRONS	THIN-SECTION	-	10	6	4	12	6	6	6	6	5	2	35	1	-	12	5	2
Water Absorption	%	ASTM-373	0	0	0	0	0	0	0	0	0	1	0	0	0	8	0	0	0
Gas Permeability	-	-	-	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	WHITE	WHITE	IVORY	IVORY	GRAY	BLACK	BLACK	GRAY
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)	172 (25)	450 (65)	620 (90)	900 (130)	48 (7)	462 (67)	480 (70)	1930 (280)
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)	-	360 (52)	200 (29)	210 (30)	152 (22)	393 (57)	410 (59)	627 (91)
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	-	0,19	0,21	-
Compressive Strength 20° C	MPa (psi X 103)	ASTM-C773	590 (86)	550 (80)	1930 (280)	2482 (360)	2103 (305)	2068 (300)	2500 (363)	2600 (377)	2500 (363)	2310 (335)	2900 (421)	1750 (254)	2500 (363)	140 (20)	2500 (363)	3500 (507)	5000 (725)
Hardness	GPa (kg/mm ²)	KNOOP 1000gm 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	10.4 (1058) 75	14.4 (1475) 85	11.8 (1200) 77	12.7 (1300) 81	-	24.5 (2500)	27.5 (2800)	-
Tensile Strength 25° C	MPa (psi X 103)	ACMA TEST # 4	-	-	155 (22)	221 (32)	193 (28)	221 (32)	248 (36)	262 (38)	248 (36)	-	290 (42)	352 (51)	-	307 (44.5)	-	-	-
Fracture toughness K _(IC)	Mpa m 1/2	NOTCHED BEAM	2	2	3-4	3-4	4-5	4-5	4-5	4-5	4-5	5-6	5-6	11	13	-	4-5	4-5	-
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	13,0	27,0	2,2	2,2	80,0	125,0	150,0	100,0
Coefficient of Thermal Expansion 25-1000° C	1X 10 ⁻⁶ /°C	ASTM-C372	9,5	5,3	7,2	8,1	8,2	8,2	8,2	8,2	8,2	8,5	8,3	10,1	10,3	3,9	4,3	4,4	5,1
Specific Heat 100° C	J/kg°K	ASTM-E1269	-	950	920	920	880	880	880	880	880	-	885	400	400	-	700	-	-
Thermal Shock Resistance ΔT _c	°C	NOTE 3	-	300	300	250	250	200	200	200	200	500	300	350	350	400	400	300	-
Maximum Use Temperature	°C	NO-LOAD COND.	1400	1700	1400	1500	1700	1700	1700	1750	1750	1400	1500	500	1500	1600	1400	1750	1000
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)	-	9.0 (228)	9.4 (240)	9.0 (228)	-	-	-	-
Dielectric Constant 1 MHz	25° C	ASTM-D150	5,9	6,0	8,2	8,8	9,1	9,0	9,6	9,7	9,8	9,8	10,6	29,0	29,0	-	-	-	-
Dielectric Loss (tan delta) 1 MHz	25° C	ASTM-D2520	0,0024	0,0020	0,0009	0,0004	0,0004	0,0002	0,0001	0,0001	0,0001	0,0010	0,0005	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 ¹³	>10 ¹⁴	>10 ¹³	>10 ¹³	-	<10 ³	>10 ⁵	<10 ³
500° C	ohm-cm	ASTM-D1829	-	5X10 ¹²	4X10 ⁸	4X10 ⁸	4X10 ⁹	4X10 ⁹	2X10 ¹⁰	2X10 ¹⁰	2X10 ¹⁰	5X10 ⁷	2X10 ⁹	2X10 ⁴	2X10 ⁴	-	<10 ³	<10 ³	<10 ³
1000° C	ohm-cm	ASTM-D1829	-	3X10 ⁵	-	5X10 ⁵	5X10 ⁵	5X10 ⁵	2X10 ⁶	2X10 ⁶	2X10 ⁷	<10 ³	3X10 ⁶	<10 ³	<10 ³	-	<10 ³	<10 ³	<10 ³
WEAR																			
Impingement	-	NOTE 4	-	-	1,00	0,45	0,52	0,50	0,48	0,47	0,47	-	0,41	0,63	0,20	-	0,14	-	0,04
Rubbing	-	NOTE 4	-	-	1,00	0,04	-	0,60	-	-	-	-	0,49	0,57	0,20	-	0,20	-	0,16

This chart is intended to illustrate typical properties of advanced ceramic materials available from Coors Ceramics Company. The designer should recognize that exact properties may vary according to product configuration and can sometimes be tailored to meet specific requirements.

Contact Coors Ceramics Company for cost-effective design, development and manufacturing assistance. The information set forth herein is offered for comparison only, and is not to be construed as absolute engineering data or constituting a warranty or representation for which we assume legal responsibility.

Notes:

1. DATA MEASUREMENTS -

All data measurements are typical and made at room temperature unless otherwise noted.

2. COMPOSITION CONTROL -

All Coors 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 T_c.

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 a AD-85 alumina control. The lower in the index, the better the wear resistance.