



Ceramic Seal Material Properties

Properties		Units	Test	ALUMINAS				CARBIDES									OTHER			
				AD-94 Nom. 94% Al ₂ O ₃	AD-96 Nom. 96% Al ₂ O ₃	FG-995 Nom. 98.5% Al ₂ O ₃	AD-995 Nom. 99.5% Al ₂ O ₃	RB-SiC (SC-2) Reaction Bonded Silicon Carbide	UltraSiC™ (SC-30) Direct Sintered Silicon Carbide	UltraSiC™ S (SC-90) Direct Sintered Silicon Carbide	UltraSiC™ S Plus (SC-90 Plus) Direct Sintered Silicon Carbide	UltraSiC™ HD Direct Sintered Silicon Carbide	UltraSiC™ P 20µm Pores Controlled Porosity DSSC	UltraSiC™ P 40µm Pores Controlled Porosity DSSC	UltraSiC GI (SC-35) Graphite Direct Sintered	UltraSiC LP (SC-51) Liquid Phase Sintered Silicon Carbide	PAD SiC-N Pressure Assisted Densification Silicon Carbide	PAD Si ₃ N ₄ NSG Pressure Assisted Densification Nuclear Seal Grade	PAD TiB ₂ Titanium Diboride	
Density		g/cm ³	ASTM-C20	3.70	3.72	3.80	3.90	3.10	3.15	3.15	3.15	3.15	3.15	3.04	3.04	3.00	3.22	3.20	3.23	4.48
Crystal Size	Average	MICRONS	THIN-SECTION	12	6	6	6	12	3 - 10	5	5	4 - 12	4 - 12	4 - 12	5	8	3	1	15	
Color		-	-	WHITE	WHITE	WHITE	IVORY	BLACK	BLACK	BLACK	BLACK	BLACK	BLACK	BLACK	BLACK	BLACK	-	BLACK	-	
Flexural Strength (MOR)	20° C	MPa (psi x 10 ³)	ASTM-F417	352 (51)	358 (52)	375 (54)	379 (55)	462 (67)	480 (70)	575 (83)	645 (94)	-	-	-	220 (32)	-	-	-	-	
				ASTM-C-1161-02C	-	-	-	-	-	-	400 (58)	-	-	-	420 (61)	300 (44)	250 (36)	-	600 (87)	570 (85)
Elastic Modulus	20° C	GPa (psi x 10 ⁶)	ASTM-C848	303 (44)	303 (44)	350 (51)	370 (54)	393 (57)	410 (59)	410 (59)	410 (59)	410 (59)	410 (59)	-	-	-	375 (52)	460 (67)	300 (43)	555 (80)
Poisson's Ratio	20° C	-	ASTM-C848	0.21	0.21	0.22	0.22	0.20	0.21	0.21	0.21	0.21	0.20	0.20	0.20	0.18	0.21	0.16	0.27	0.11
Compressive Strength	20° C	MPa (psi x 10 ³)	ASTM-C773	2103 (305)	2068 (300)	2500 (363)	2600 (377)	2700 (363)	3500 (507)	3500 (507)	3750 (544)	-	-	-	-	675 (91)	-	3410 (494)	-	-
Hardness		kg/mm ²	KNOOP 100gm	-	-	-	-	2500	2800	2800	2800	2800	2800	2800	2800	2800	2800	2400	1550	2700
				R45N	ROCKWELL 45 N	78	78	82	83	-	-	-	-	-	-	-	-	-	-	-
Tensile Strength	25° C	MPa (psi x 10 ³)	ACMA TEST #4	193 (28)	221 (32)	248 (36)	262 (38)	307 (44.5)	-	-	-	-	-	-	-	-	-	-	-	-
Fracture Toughness	K(I c)	MPam ^{1/2}	NOTCHED BEAM	4 - 5	4 - 5	4 - 5	4 - 5	4.0	4.0	4.0	4.0	3.8	3.0	3.0	3.0	3.2	6.3	4.7	5.5	6.9
Thermal Conductivity	20° C	W/m K	ASTM-C408	22.4	24.7	27.5	30.0	125.0	150.0	150.0	150.0	150.0	150.0	-	-	125.0	80.0	130.0	20.0	-
Coefficient of Thermal Expansion	25-1000° C	1X 10 ⁻⁶ /°C	ASTM-C372	8.2	8.2	8.2	8.2	4.3	4.4	4.4	4.4	4.5	4.5	4.5	4.4	4.4	4.7	4.5	3.3	-
Specific Heat	100° C	J/kg*K	ASTM-E1269	880	880	880	880	800	800	800	800	800	775	775	775	820	820	-	-	-
Thermal Shock Resistance	Δ Tc	°C	①	250	250	200	200	400	300	300	300	-	-	-	-	600	300	-	-	-
Dielectric Strength	6.35mm	ac-kV/mm (ac V/mil)	ASTM-D116	8.3 (210)	8.3 (210)	8.7 (220)	8.7 (220)	-	-	-	-	-	-	-	-	-	-	-	-	-
Dielectric Constant	1 MHz	25° C	ASTM-D150	9.1	9.0	9.6	9.7	-	-	-	-	-	-	-	-	-	-	-	-	-
Dielectric Loss (tan delta)	1 MHz	25° C	ASTM-D150	0.0004	0.0002	0.0002	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-
Volume Resistivity	25° C	ohm-cm	ASTM-D1829	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	> 10 ¹⁴	< 10 ³	< 10 ⁵	< 10 ⁵	< 10 ⁵	< 10 ⁵	< 10 ⁵	< 10 ⁵	< 10 ⁵	< 10 ⁵	-	> 10 ⁴	-	-
	500° C	ohm-cm	ASTM-D1829	4 x 10 ⁹	4 x 10 ⁹	2 x 10 ¹⁰	2 x 10 ¹⁰	< 10 ³	< 10 ³	< 10 ³	< 10 ³	< 10 ³	< 10 ³	< 10 ³	< 10 ³	< 10 ³	-	-	-	-
	1000° C	ohm-cm	ASTM-D1829	5 x 10 ⁵	1 x 10 ⁶	2 x 10 ⁶	2 x 10 ⁶	< 10 ³	< 10 ²	< 10 ³	< 10 ³	< 10 ³	< 10 ²	< 10 ²	< 10 ²	< 10 ³	-	-	-	-
Pore Volume Fraction		% typical	-	-	-	-	-	-	-	-	-	-	-	5	5	-	-	-	-	-
Fired Pre Diameter		µm	-	-	-	-	-	-	-	-	-	-	-	15.0	34.6	-	-	-	-	-
Pore Distribution		pores / mm ²	-	-	-	-	-	-	-	-	-	-	-	150 - 200	50 - 80	-	-	-	-	-

MECHANICAL

THERMAL

ELECTRICAL

OTHER

Americas

+1 303 271 7100 tel
+1 855 929 7100 toll free in USA
coorstek.com
info@coorstek.com

Europe

+49 160 530 3768
infoeurope@coorstek.com

Japan

+81 3 5437 8411
japaninfo@coorstek.com

China

+86 21 6232 1125
info_shanghai@coorstek.com

Korea

+82 31 613 2946
koreainfo@coorstek.com

① 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.

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The chart is intended to illustrate typical properties. Property values vary with method of manufacture, size, and shape of part. Close control of values of most properties can be maintained if specified. Data contained herein is not to be construed as absolute and does not constitute a representation or warranty for which CoorsTek assumes legal responsibility.