



**Sintered Ceramics**

Material Properties	Units	Test	Mullite	Alumina 94%	Alumina 96%	Alumina 99.5%	Alumina 99.8%	Zirconia ZTA
Density	gm/cc	ASTM-C20	2.80	3.70	3.72	3.90	3.92	4.01
Crystal Size Avg.	µm	THIN-SECTION	10	12	6	6	6	2
Water Absorption	%	ASTM-373	0	0	0	0	0	0
Gas Permeability	-	-	0	0	0	0	0	0
Color	-	-	Tan	White	White	Ivory	Ivory	White
Flexural Strength (MOR) @ 20°C	MPa (psi x 10 <sup>3</sup> )	ASTM-F417	170 (25)	352 (51)	358 (52)	379 (55)	375 (54)	450 (65)
Elastic Modulus @ 20°C	GPa (psi x 10 <sup>6</sup> )	ASTM-C848	150 (22)	303 (44)	303 (44)	370 (54)	370 (54)	360 (52)
Poisson's Ratio @ 20°C	-	ASTM-C848	-	0.21	0.21	0.22	0.22	0.23
Compressive Strength @ 20°C	MPa (psi x 10 <sup>3</sup> )	ASTM-C773	550 (80)	2103 (305)	2068 (300)	2600 (377)	2500 (363)	2900 (421)
Hardness	GPa (kg/mm <sup>2</sup> ) R45N	KNOOP 1000gm ROCKWELL 45 N	7.4 (750) 70	11.5 (1175) 78	11.5 (1175) 78	14.1 (1440) 83	14.1 (1440) 83	14.4 (1475) 85
Tensile Strength @ 25°C	MPa (psi x 10 <sup>3</sup> )	ACMA TEST #4	-	193 (28)	221 (32)	262 (38)	248 (36)	290 (42)
Fracture Toughness K(I c)	MPa m <sup>1/2</sup>	NOTCHED BEAM	2	4-5	4-5	4-5	4-5	5-6
Thermal Conductivity @ 20°C	W/m °K	ASTM-C408	3.5	22.4	24.7	30.0	30.0	27.0
Coefficient of Thermal Expansion 25-1000°C	1 x 10 <sup>-6</sup> /°C	ASTM-C372	5.3	8.2	8.2	8.2	8.2	8.3
Specific Heat @ 100°C	J/kg · K	ASTM-E1269	950	880	880	880	880	885
Thermal Shock Resistance ΔTc	°C	NOTE 3	300	250	250	200	200	300
Max Use Temperature	°C	NO-LOAD COND.	1700	1700	1700	1750	1750	1500



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Dielectric Strength	ac-kV/mm acV/mm	ASTM-D116	9.8 248	8.3 210	8.3 210	8.7 220	8.7 220	9.0 228
Dielectric Constant 1 MH	25°C	ASTM-D150	6.0	9.1	9	9.7	9.8	10.6
Dielectric Loss (tan delta) 1 MHz	25°C	ASTM-D150	0.0020	0.0004	0.0002	0.0001	0.0001	0.0005
Volume Resistivity @ 25°C @ 500°C @ 1000°C	ohm-cm	ASTM-D1829	> 10 <sup>14</sup> 5 x 10 <sup>12</sup> 3 x 10 <sup>5</sup>	> 10 <sup>14</sup> 4 x 10 <sup>9</sup> 5 x 10 <sup>5</sup>	> 10 <sup>14</sup> 4 x 10 <sup>9</sup> 1 x 10 <sup>6</sup>	> 10 <sup>14</sup> 2 x 10 <sup>10</sup> 2 x 10 <sup>6</sup>	> 10 <sup>14</sup> 2 x 10 <sup>10</sup> 2 x 10 <sup>7</sup>	> 10 <sup>14</sup> 2 x 10 <sup>9</sup> 3 x 10 <sup>6</sup>
Impingement	-	NOTE 4	-	0.52	0.50	0.47	0.47	0.41
Rubbing	-	NOTE 4	-	-	0.60	-	-	0.49

Notes:

1. Data Measurements - All data measurements are typical and made at room temperature unless otherwise noted.
2. Composition Control - All ceramic compositions are controlled using modern chemical, spectrograph, 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 DTc.
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.
5. Dielectric Strength numbers represent measurements on samples that were 0.25” thick.

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. 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.