



MATERIAL  
SELECTION  
GUIDE

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## STANDARD MATERIAL SPECIFICATION

Properties	Units	ASTM	ALUMINA (92%)	ALUMINA (94%)	ALUMINA (96%)
			Alotec 92	771	614
Density	g/cc	C373	3.65	3.6	3.7
Hardness	HV 0.5	C1327	1300	1200	1350
Flexural Strength	MPa (k PSI)	C1161	240 (34.8)	290 (42)	296 (43)
Fracture Toughness	MPa*m <sup>1/2</sup>	C1421	5	3	4
Young's Modulus	GPa (*10 <sup>6</sup> PSI)	C1259	300 (44)	289 (42)	303 (44)
Shear Modulus	GPa (*10 <sup>6</sup> PSI)	C1259	120 (17)	121 (17.5)	127 (18.5)
Poisson		C1259	0.24	0.21	0.21
Thermal Expansion	*10 <sup>-6</sup> /°C	E228			
	300°C		7.0	6.6	6.5
	700°C		7.3	7.6	7.6
	1000°C		7.5	8.2	8.1
Thermal Conductivity @ 25°C	W/m-K	E1461	21.0	21.0	24.0
Volume Resistivity	ohm-cm	D257	>e <sup>14</sup>	>e <sup>14</sup>	>e <sup>14</sup>
Specific Heat	J/g-K	E1461	0.96	0.8	1.1
Dielectric Strength	volts/mil	D149	–	200	210
Dielectric Constant @ 1MHz		D150	–	9.0	9.3
Dissipation Factor @ 1MHz		D150	9.0E-04	3.0E-04	3.0E-04
Loss Factor @ 1MHz		D150	–	3.0E-03	3.0E-03

ALUMINA (99.5%)	ALUMINA (99.5%)	TOUGHENED ALUMINA	ZIRCONIA	TITANIA	STEATITE	STEATITE
838	975	977	848	192	645	665
3.9	3.9	4.0	6.0	4.0	2.7	2.8
1700	1700	1600	1150	800	450	420
310 (45)	305 (45)	448 (65)	752 (109)	138 (20)	131 (19)	145 (21)
4	4	4	10	3	NA	NA
372 (54)	376 (54)	–	186 (27)	227 (33)	108 (16)	112 (16)
152 (22.0)	152 (22.0)	–	80 (11.6)	90 (13.0)	43 (6.3)	45 (6.5)
0.21	0.21	–	0.33	0.27	0.23	0.25
6.8	6.7	7.9	–	8.3	8.2	6.9
7.9	7.8	8.5	10.0	9.0	8.9	7.8
8.3	8.2	9.6	11.0	9.0	9.4	8.0
30.0	30.0	25.0	2.7	11.9	5.5	5.9
>e <sup>14</sup>	>e <sup>14</sup>	3.6E+13	–	>e <sup>12</sup>	>e <sup>14</sup>	>e <sup>14</sup>
0.8	0.8	0.7	0.4	0.7	1.1	1.1
230	220	200	–	100	210	230
9.8	9.8	3.7	28	85	5.8	6.1
1.0E-04	1.0E-04	4.5E-04	–	5.0E-04	1.9E-03	8.0E-04
1.0E-03	1.0E-03	–	–	–	1.1E-02	5.0E-03

All statements, technical information, and recommendations contained herein are based on tests we believe to be reliable, but the accuracy or completeness thereof is not guaranteed. Before using or purchasing any product described herein, the user shall determine the suitability of the product for its intended use; the user shall assume all risks and liabilities whatsoever in connection with the use of such products.

**Note:** All purities percentages are nominal.

### Aluminas

Aluminas exhibit good mechanical properties such as hardness, compressive and tensile strength, and elastic modulus. They perform well at elevated temperatures.

**Alotec 92 (92%)** offers excellent abrasion resistance due to its controlled grain size and microstructure. Its high density and chemical composition also give it a greater impact resistance than many other ceramics. This combination of superior wear and impact resistance provides a cost saving solution by having less down time and maintenance costs.

**771 (94%)** is an alumina ceramic with good electrical and mechanical properties. It is easily metalized by the moly process.

**614 (96%)** is a high-strength alumina with good mechanical properties, as well as good wear and chemical resistance. It also features excellent electrical properties.

**975 (99.5%)** offers unique technology by virtue of its optimal dispersion of the MgO phase with the alumina grains. With virtually no transgranular porosity in its microstructure, 975 exhibits high density, superior wear resistance, and moderate flexural strength. Another advantage is its highly uniform white color compared to conventional 99.5% aluminas. The material's white color remains consistent under either reducing or oxidizing conditions.

### Steatites

Steatites used in place of aluminas are a cost-effective way to meet performance requirements. They are easier to form and fire at lower temperatures.

**645 L423C** has good mechanical and electrical properties.

**665 L523C** has low dielectric loss. It makes excellent insulators for radio frequency applications.

### Toughened Alumina

**977** is a zirconia toughened alumina ceramic which was designed for use in ballistic and ceramic armor applications.

### Titania

**192** is an excellent material for textile and other structural applications, where superior surface finishes are required with high chemical resistance.

### Zirconia

**848 TZP (yellow)** is recommended for applications where high fracture toughness is required, with higher elastic modulus.