

Properties	Units	Test	Alumina (99.5%)	Aluminum Nitride	Schott Borofloat 33	Boron Nitride	Fused Silica	Macor	Quartz	Sapphire	Silicon	Silicon Carbide (CVD)	Silicon Carbide	Silicon Nitride	Titanium Nitride	Zirconia
<b>Physical</b>																
Chemical Formula	-	-	Al <sub>2</sub> O <sub>3</sub>	AlN	borosilicate glass	BN	synthetic silicon dioxide	glass ceramic	SiO <sub>2</sub>	a-Al <sub>2</sub> O <sub>3</sub>	Si	SiC	a-SiC	Si <sub>3</sub> N <sub>4</sub>	TiN	ZrO <sub>3</sub>
Density, ρ	g/cm <sup>3</sup>	ASTM C20	3.7-3.97	3.26	2.23	2.28	2.201	2.52	2.21	3.97	2.33	2.8-3.1	3.21	3.31	5.22	6.02
Color	-	-	ivory/white	gray	white/transparent	white	transparent	white	white/transparent	white/transparent	gray	black	dark gray	dark gray	gold	ivory
Crystal Structure	-	-	hexagonal	hexagonal	random	hexagonal	amorphous	random	hexagonal	trigonal	cubic	cubic	hexagonal	hexagonal (alpha & beta)	cubic	tetragonal
Hardness	Moh's	-	9	7	--	2	5.3-6.5	4.5	7	9	7	--	9-10	9	9-9.5	6.5
Hardness	knoop (kg/mm <sup>2</sup> )	Knoop 100g	2000	1100	480	25-205	522	250	820	2200	1150	3000	2800	2200	2000	1600
<b>Mechanical</b>																
Modulus of Elasticity																
(Young's Mod.)	GPa	ASTM C848	360	330	63	675	72.1	66.9	70	250-400	112	450	476	317	600	207
Flexural Strength (MOR)	MPa @ R.T.	ASTM F417	295-325	320	--	51.8	--	94	80	760-1035	300	480 (200°C)	324	679-896	--	900
Poisson's Ratio, ν		ASTM C818	0.27	0.24	0.2	0.05	0.179	0.29	0.17	0.29	0.28	0.21	0.19	0.23	0.25	0.32
Fracture Toughness, K <sub>Ic</sub>	MPa x m <sup>1/2</sup>	Notched Beam Test	4.5	2.6	--	2.6	1.2	1.53	--	1.89	3-6	2.7-3.3	4	5-8	--	13
<b>Thermal</b>																
Max. Use Temperature																
(* denotes inert atm.)	°C	No load cond.	1750	800	500	985	893	1000	1200	2000	1350	--	1400	1500	600	500
Thermal Shock Resistance	ΔT (°C)	Quenching	200	--	140-175	>1500	--	25-100	>1400	200	--	--	350-500	750	--	280-360
Thermal Conductivity	W/m-K @ R.T.	ASTM C408	35	30.1	1.12	20	1.38	1.46	1.4	40	125	67	41	27	19	2.2
Coefficient of Linear Thermal Expansion, α <sub>L</sub>	μm/m-°C (~25°C through ±1000°C)	ASTM C372	8.4	4.5	3.25 (through 300°C)	1-2	5.5	7.4-11.4	0.45	7.9-8.8	2.49-4.44	4.5	5.12	3.4	9.4	11
Specific Heat, c <sub>p</sub>	cal/g-°C @ R.T.	ASTM C351	0.21	0.14	0.2	0.19	0.177	0.19	0.16	0.18	0.18	0.228	0.15	0.17	--	0.1
<b>Electrical</b>																
Dielectric Constant	1MHz @ R.T.	ASTM D150	9.6	9	4.6	4.08	3.8	6.03	3.8	9.3-11.4	11.8	--	10.2	7	--	26 (@100kHz)
Dielectric Strength	kV/mm	ASTM D116	15	17	16	374	25-40	9.4	25-40	15-50	--	--	--	17.7	--	9
Electrical Resistivity	Ωcm @ R.T.	ASTM D1829	10 <sup>14</sup>	10 <sup>13</sup>	--	10 <sup>13</sup>	>10 <sup>20</sup>	>10 <sup>17</sup>	6x10 <sup>10</sup>	10 <sup>17</sup>	10 <sup>-3</sup>	1-1000	10 <sup>8</sup>	10 <sup>13</sup>	2.5x10 <sup>-5</sup>	>10 <sup>13</sup>

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