



**Technical Products, Inc.**

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## (Al<sub>2</sub>O<sub>3</sub>) Alumina 96% Substrate Material Specifications

Alumina Oxide (Al<sub>2</sub>O<sub>3</sub>) is a readily available material with reasonable processing cost, possessing excellent mechanical, electrical, and wear properties. Alumina Substrates are used in a wide range of applications not limited to automotive, circuitry, computer, LED's, microwave and military.

Technical Products capabilities include laser cutting, drilling, engraving, fabrication, lapping and polishing.

Physical Properties	Units	Test	Al <sub>2</sub> O <sub>3</sub> -96%
Density	g/cm <sup>3</sup> / lb/ft <sup>3</sup>	ASTM-C373	3.72 / 0.134
Color	-	-	White
Water Absorption	%	ASTM-C373	0
Hardness (Rockwell)	-	ASTM E18,R45N	82
Surface Finish – CLA (as-fired)	Microinches (Micrometers)	Profilometer 0.0002" Radius Stylus 0.100" Cutoff ANSI/ASME B46.1	35 / 0.89
Average Grain Size	Micrometers	INTERCEPT METHOD	4-7

Mechanical Properties	Units	Test	Al <sub>2</sub> O <sub>3</sub> -96%
Modulus of Elasticity	GPa / psi 10 <sup>6</sup>	ASTM-C623	331 / 44
Flexural Strength	MPa / Kpsi	ASTM-F394	400 / 58
Poisson's Ratio	-	ASTM-C623	0.25
Gas Permeability	-	-	0

Thermal Properties	Units	Test	Al <sub>2</sub> O <sub>3</sub> -96%
Thermal Conductivity, 20°C 100°C 400°C	W/m <sup>2</sup> K BTU•in/ft•h•°F	VARIOUS	26 (180) 20 (139) 12 (83)
Coefficient of Linear Thermal Expansion 25°C – 200°C 25°C – 500°C 25°C – 800°C 25°C – 10000°C	10 <sup>-6</sup> /°C 10 <sup>-6</sup> /°F	ASTM-C372	6.4 / 3.6 7.2 / 4.0 7.9 / 4.4 8.2 / 4.6

Electrical Properties	Units	Test	Al <sub>2</sub> O <sub>3</sub> -96%
Dissipation Factor (Loss Tangent) 1KHz 1MHz	@ 25°C	ASTM-D150	0.0010 0.0004
Dielectric Constant (Relative Permittivity) 1KHz 1MHz	@ 25°C	ASTM-D150	9.5 9.5
Dielectric Strength (60 cycles AC avg. RMS) 0.025" Thick 0.040" Thick	Volts/mil (Kv/mm)	ASTM-D149	600 ( 23.6) 490 (19.3)
Loss Index (loss Factor) 1KHz 1MHz	@ 25°C	ASTM-D150	0.009 0.004
Volume Resistivity 25°C 300°C 500°C 700°C	ohm-cm or ohm-cm <sup>2</sup> /cm	ASTM-D1829	>10 <sup>14</sup> 1.0 X 10 <sup>12</sup> 1.0 X 10 <sup>9</sup> 1.0 X 10 <sup>8</sup>

\*\*The information provided in this table is a compilation of publicly available data. This information is provided for comparison purposes only, and is not intended to be warrantable. Further, Technical Products, Inc. disclaims any and all liability from errors, in accuracies, or omissions.