

KYOCERA • ALUMINA MATERIAL PROPERTIES

Kyocera No.			A-445	A-473	A-476T	A-493	
Appearance			Dense	Dense	Dense	Dense	
Colour			Dark Brown	White	White	White	
Alumina Content (%)			91	92	96	99.6	
Main Characteristics			Opacity High Heat Dissipation	Metalising Mechanically Strong	Standard Substrate Material	Good surface smoothness	
Main Applications			IC Packages, Lids	Lids, Substrates For Refractory	Thick Film Substrates	Thin Film Substrates	
	Bulk Density	-	3.9	3.6	3.8	3.9	
	Water Absorption	%	0	0	0	0	
Mechanical Characteristics	Vickers Hardness (Load 500g)	kg/mm ²	1,100	1,350	1,500	1,650	
	Flexural Strength	psi, kg/cm ²	30,000 2,100	46,000 3,200	40,000 2,800	70,000 5,000	
	Compressive Strength	psi, kg/cm ²	- -	- -	- -	- -	
Thermal Characteristics	Youngs (x10 ⁶) Modulus (x10 ⁶)	psi, kg/cm ²	- -	39 2.7	- -	- -	
	Coefficient of Linear Thermal Expansion	40°-400°	1/°C	7.2	6.9	7.1	7.2
		40°-800°C	(x10 ⁻⁶)	8.1	7.7	7.8	8.2
	Thermal Conductivity	20°	cal-cm/cm ² -sec-°C	0.04	0.04	0.05	0.08
	Specific Heat		cal/g°C	0.19	0.19	0.19	0.19
Max. Use Temperature		°C	1,200	1,500	1,600	1,750	
Electrical Characteristics	Dielectric Strength		kv/mm	10	10	10	10
	Volume Resistivity	20°C	Ω-cm	>10 ¹²	>10 ¹⁴	>10 ¹⁴	>10 ¹⁴
		300°C		10 ⁸	10 ¹³	10 ¹⁴	10 ¹⁴
		500°C		10 ⁷	10 ¹⁰	10 ¹¹	10 ¹²
	Dielectric Constant	(1MHz)	-	7.9	9.5	10.2	9.9
Dielectric Loss Angle	(1MHz)	(10 ⁻⁴)	-	8	2	2	
Loss Factor		(x10 ⁻⁶⁴)	-	76	19	19	

