

# FR-995 Ceramic Material Specifications

## DESCRIPTION

FR-995 is a general purpose high purity alumina ceramic material that offers excellent dielectric properties along with high compressive strength and good thermal insulation properties. It is softer than higher purity alumina ceramics, making it easier to hard grind, and can be thick metallized to create hermetic assemblies for a wide range of applications. Our FR-995 can be precision-machined prior to firing to enable complex soft to size components.

## FEATURES AND HIGHLIGHTS

- High Dielectric Strength
- Metallizable for hermetic assemblies
- High compressive strength
- High volume resistivity
- Enables making complex green machined components

## PROPERTIES

FR-995	Test	
<b>Physical Properties</b>		
Color	Visual	Ivory-White
Density g/cm <sup>3</sup>	ASTM C373-88, ASTM C20	3.85
Crystalline Phase % Alpha	XRD	100
Water Absorption %	ASTM C373-88	0%
Flexural Strength PSI 3-Point PSI	ASTM C1161, F417	60,000
Compressive Strength (PSI)	ASTM C773	330,000
Hardness (GPA)	ASTM C1327 Vickers	1200
Impurities (SiO <sub>2</sub> ) PPM	ICPMS	<1000
Impurities (Na <sub>2</sub> O) PPM	ICPMS	<600
Impurities (CaO) PPM	ICPMS	<1000
Impurities (K <sub>2</sub> O) PPM	ICPMS	<100
Impurities (Fe <sub>2</sub> O <sub>3</sub> ) PPM	ICPMS	<300
Impurities (TiO <sub>2</sub> ) PPM	ICPMS	<100
Impurities (C) PPM	ICPMS	<1
Impurities (S) PPM	ICPMS	<1
<b>Thermal Properties</b>		
Thermal Conductivity W/m-K	ASTM C408 (100°C)	23
Thermal Expansion Coefficient x 10 <sup>-6</sup> /°C	ASTM C372 (40- 400°C)	6.9
<b>Electrical Properties</b>		
Dielectric Strength KV/mm	ASTM D149	9.84
Dielectric Constant (1 MHz)	ASTM D2520 (1 MHz)	9.70
Dielectric Loss Tangent (1 MHz)	ASTM D150 (1 MHz)	0.0009
Volume Resistivity ohm-cm	ASTM D257 (RT)	>10 <sup>13</sup>

## APPLICATIONS INCLUDE

- Assemblies for aerospace applications
- Semiconductor chamber components
- Submersible pumps and sensors
- Fluid bearings
- Fluid channeled devices
- Hermetic feedthroughs
- High voltage components
- Process boats for battery materials
- Large components for thermal energy storage
- Rotors and stators for medical applications
- Pressure plates

## FRALOCK CAPABILITIES

- Alumina diameter up to 31" diameter part size
- Alumina thickness up to 3" (disk shape) or 12" height (cylinder shape)
- Green to fire Alumina and green-to-fire tolerances +/- 1.0%
- Hard grind to tolerances within 0.00002" (0.000508mm)
- Surface metallization
- Plating, lapping, dicing and brazing
- Pre-fired CNC machining tolerances +/- 1%
- Post fired dicing to +/- .001"