FRALOCK® *Leading the Way in Advanced Materials Solutions*

FR-997 Ceramic Material Specifications

DESCRIPTION

FR-997 is a 99.7% pure alumina ceramic material, containing less than 500 ppm silica, intended for applications where excellent surface finishes and superior chemical corrosion resistance are required. It offers fluorine plasma resistance, good dielectric properties, high compressive strength, and excellent hardness for resisting fluid cavitation and fretting wear damage. FR-997 can be thermally processed to customize hardness and improve machinability without changing its chemical composition.

FEATURES AND HIGHLIGHTS

- Excellent resistance to hydrofluoric acid attack
- Resistant to Plasma Fluorine ion damage
- Capable of thermal application temperatures up to 1,400C°
- High compressive strength
- No measurable interconnected porosity and a bulk density of >3.91 g/cm^3
- High volume resistivity
- Low silica enables excellent fluid cavitation damage resistance.
- Fine grain size enables polishing to less than 8 micro inches Ra
- Can be green machined to fabricate components up to 31 inches in diameter
- Can be frit bonded to create internal vacuum channels

Applications Include

- Semiconductor chamber components
- Submersible pumps and sensors
- Advanced electronic sensor packages
- Ceramic devices accurate fluid metering
- Fluid bearings for seawater applications
- High voltage electrical insulation
- High pressure fluid pumping applications
- Large components for handling corrosive fluids or molten metals.
- Robot end effectors
- Rotors and stators for medical applications

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 (cost-saving over post-fire machining) 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 +/- 0.001”

PROPERTIES

FR-997	Test	
Physical Properties		
Color	Visual	Ivory
Density g/cm3	ASTM C373-88, ASTM C20	3.91
Grain Size Microns	ASTM E112-10	6 (16)
Crystalline Phase % Alpha	XRD	100
Water Absorption %	ASTM C373-88	0%
Flexural Strength PSI 3-Point PSI	ASTM C1161, F417	51,092
Modulus of Elasticity GPA per ASTM C1198	ASTM C1198	347
Poissons ratio	ASTM C848	0.22
Compressive Strength (PSI)	ASTM C773	323,000
Hardness (GPA)	ASTM C1327 Vickers	1650
Fracture Toughness MPa√m	Single Edge Notched	4.19
Additives (YtO3) Wt%	ICPMS	N/A
Impurities (SiO2) PPM	GDMS	<500
Impurities (Na2O) PPM	GDMS	<400
Impurities (CaO) PPM	GDMS	<400
Impurities (K2O) PPM	GDMS	<100
Impurities (Fe2O3) PPM	GDMS	<400
Impurities (TiO2) PPM	GDMS	<100
Impurities (C) PPM	GDMS	<50
Impurities (S) PPM	GDMS	<50
Thermal Properties		
Thermal Expansion Coefficient x 10-6 /°C	ASTM C372 (40- 400°C)	6.94
Thermal Expansion Coefficient x 10-6 /°C	ASTM C372 (40- 800°C)	7.81
Electrical Properties		
Dielectric Strength KV/mm	ASTM D149	7.60
Dielectric Constant (1 MHz)	ASTM D2520 (1 MHz)	9.76
Dielectric Loss Tangent (1 MHZ)	ASTM D150 (13 MHz)	0.0011
Volume Resistivity ohm-cm	ASTM D257 (RT)	6.50E+14
Volume Resistivity ohm-cm	(300°C)	1.30E+13
Volume Resistivity ohm-cm	(700°C)	1.30E+09

