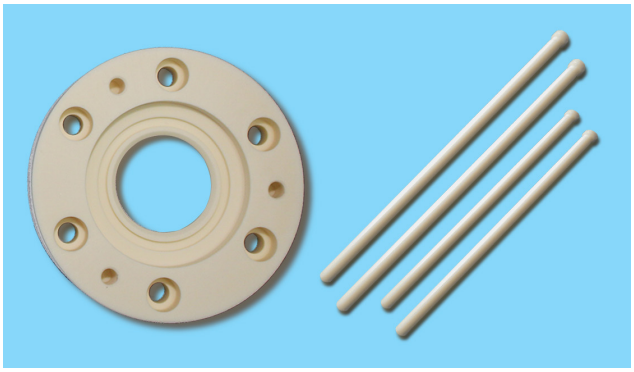
FRALOCK® *Leading the Way in Advanced Materials Solutions*

FR-AlN-ST Ceramic Material Specifications

DESCRIPTION



FR-AlN-ST is an advanced structural Aluminum Nitride ceramic made using high temperature liquid phase sintering. It is a fully dense, tan colored, structural ceramic capable of being made using near net shape and diamond grinding processes. With low soda and silica concentrations, it is ideal for semiconductor, commercial, and aerospace applications demanding high thermal conductivity. Thermal expansion rates of FR-AlN-ST match those of Tungsten and Molybdenum very well, enabling creating hermetic assemblies capable of a wide range of operational temperatures. Yttria additions to enable liquid phase sintering also promote adhesion strength of traditional Mo/Mn and Mo/Mn/W thick film metallization systems.

FEATURES AND HIGHLIGHTS

- High thermal conductivity of 180 w/mK at 100°C; much higher below room temperature
- Capable of withstanding heating and cooling rates >350°C per second
- Precision green machining available to create complex near net shape components
- Low soda content meets most stringent semiconductor equipment specifications
- Excellent resistance to Fluorine plasma and Hydrofluoric acid
- High dielectric strength and low loss make it great for RF and DC electrical applications
- Yttria additive promotes adhesion of thick film metallization paints enabling hermetic assemblies
- Near net shape processing reduces costs for making large sized components
- Available in plate, tube, and rod shapes up to 40 cm in dimensions and wall thickness up to 2 cm

APPLICATIONS INCLUDE

- Semiconductor chamber components
- Material processing temperature control devices
- Gas distribution plates and nozzles
- Electrostatic clamping devices
- RF Antennas
- Heaters and cooling devices for commercial and aerospace
- Thermal medicinal vaporizers
- Ceramic heat exchangers
- Hermetic assembles for space vehicles

FRALOCK CAPABILITIES

- AlN diameter up to 15” diameter part size
- AlN thickness up to 0.8” (disk shape) or 12” height (cylinder shape)
- Green to fire 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-AlN-ST	Test	
Physical Properties		
Color	Visual	Tan
Density g/cm3	ASTM C373-88, ASTM C20	3.36
Water Absorption %	ASTM C373-88	0%
Flexural Strength PSI 3-Point PSI	ASTM C1161, F417	50,763
Modulus of Elasticity GPA per ASTM C1198	ASTM C1198	322
Additives (YtO3) Wt%	ICPMS	>3%
Impurities (SiO2) PPM	ICPMS	<150
Impurities (Na2O) PPM	ICPMS	<200
Impurities (CaO) PPM	ICPMS	<400
Impurities (K2O) PPM	ICPMS	<100
Impurities (Fe2O3) PPM	ICPMS	<30
Impurities (TiO2) PPM	ICPMS	<100
Impurities (C) PPM	ICPMS	<300
Impurities (S) PPM	ICPMS	<30
Thermal Properties		
Thermal Conductivity W/m-K	ASTM C408 (100°C)	180
Thermal Expansion Coefficient x 10-6 /°C	ASTM C372 (40- 400°C)	4.3
Electrical Properties		
Dielectric Strength KV/mm	ASTM D149	14.00
Dielectric Constant (1 MHz)	ASTM D2520 (1 MHz)	8.60
Dielectric Loss Tangent (1 MHZ)	ASTM D150 (1 MHz)	0.00012

