

# ENCAPSULATED PROTECTIVE SOLUTIONS

## Teflon-Encapsulated Polyimide for Plasma Protection in Semiconductor Wafer Fabrication Equipment

*Technical Data Sheet*

Protective encapsulation and lamination of materials has proven to be an excellent solution for extending the life of components in semiconductor manufacturing equipment. Fralock's adhesiveless lamination provides the ability to layer these materials together in many combinations without the use of adhesives to provide unsurpassed protection against plasma during wafer fabrication.

Teflon shims have been shown to be highly effective in etch and CVD for plasma protection applications, but it compresses with pressure and heat, requiring frequent replacement. When a layer of polyimide is sealed between two Teflon layers, the added rigidity decreases the overall compression and greatly extends the lifetime of the component. Fralock manufactures a material that completely encapsulates polyimide with Teflon, creating a protective seal for the polyimide and a more durable plasma-resistant component.

Similar enhanced performance and lifetime is also feasible in wet-process applications when Teflon encapsulated polyimide is used.

### Material Properties

- Fully encapsulated design - polyimide core
- Fluoropolymer on all sides of polyimide core
  - Top, bottom, inside and outside diameter, thru holes, u-slots

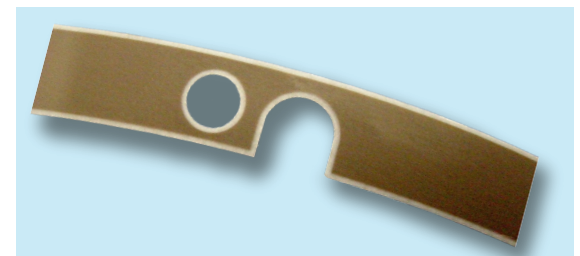
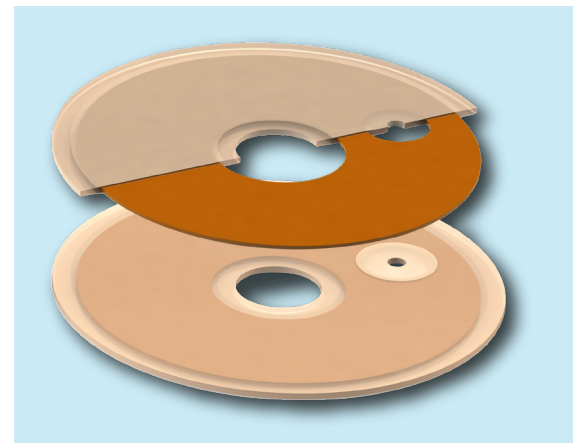
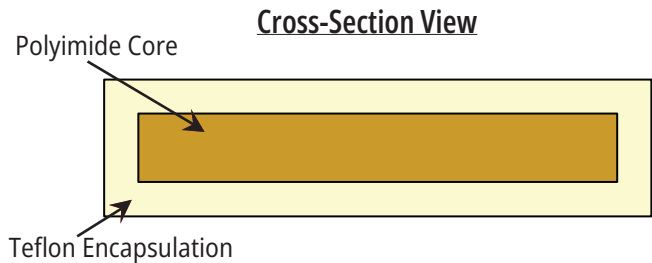
### Benefits

- Reduced erosion rate in plasma
- Eliminates risk of cold flow that can occur with Teflon-only products
  - Teflon has no memory and can change shape when compressed
- Extended time between preventative maintenance
- Enhances plasma resistance in etch and CVD for plasma protection applications

### Manufacturing Capabilities

Fralock's advanced capabilities enable custom fabrication of Encapsulated Shims/Gaskets to your specifications.

Assembly and packaging services available with in-house clean rooms certified to ISO 14644-1, class 5 (100) to class 7 (10,000) standards.



## Typical Properties

Property	Values			Imperial Unit (Metric Unit)	Test Method (if applicable)	
	FR11003-005	FR11003-010	FR11003-030			
Thickness	5 (0.13)	10 (0.25)	30 (0.76)	mil (mm)	n/a	
Density	0.0637 (1764.1)	0.0641 (1773.0)	0.0548 (1517.7)	lb/in <sup>3</sup> (kg/m <sup>3</sup> )	ASTM D792-20	
Tensile Strength	18.5	15.0	21.1	ksi	ASTM D882-18	
Modulus	Longitudinal:	691	631			
	Transverse:	2010	2008			
Poisson's Ratio	0.344	0.317	0.354	n/a		
Elongation at Break	12	6	11	%		
Dielectric Breakdown Voltage	11424	16418	>50000	V	ASTM D149-20	
Dielectric Strength	2050	1665	1667	V/mil		
Dielectric Constant @ 10 kHz	2.083	2.170	2.398	n/a	ASTM D150-18	
Dissipation Factor @ 10 kHz	0.002	0.001	0.001			
Thermal Conductivity	1.3436 (0.1938)	1.4070 (0.2029)	0.5219 (0.0753)	BTU[IT]-in/h·ft <sup>2</sup> ·°F (W/m·K)	ASTM E1530-19	
Glass Transition Temperature (T <sub>g</sub> )	"1 <sup>st</sup> " T <sub>g</sub> Point: "2 <sup>nd</sup> " T <sub>g</sub> Point:	31.6 (-0.2) 58.6 (14.8)	32.9 (0.5) 56.7 (13.7)	n/a °F (°C)	ASTM E1356-08	
Heat Capacity (C <sub>p</sub> ) @ 25°C		0.2558 (1.071)	0.2589 (1.084)	0.2687 (1.125)	BTU[IT]/lb·°F (J/g·°C)	ASTM E1269-11 ASTM E967-18
Outgassing:	TML:	0.37	0.34	0.59	%	ASTM E595-15
	CVCM:	0.02	0.01	0.01		
	WVR:	0.19	0.12	0.13		

TML = Total Mass Loss

CVCM = Collected Volatile Condensable Materials

WVR = Water Vapor Recovered

\*Material is RoHS compliant

## Ordering Information:

**Material:** FR11003-XXX (-XXX represents thickness in mils)

**Contact us for more information on Encapsulated Shims/Gaskets and other related products.**

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