



Adhesive Films and Preforms

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## TF T2321F THERMALLY CONDUCTIVE FILM

### Description:

TechFilm T2321F is a high performance, highly thermally conductive\electrically insulating, B-staged film adhesive. It features a relatively low coefficient of thermal expansion, high glass transition temperature and good adhesion to various substrates. It also features good chemical, heat, and moisture resistance.

### Shelf Life: (Stored in dry conditions)

One month @ 20°C    Two months @ 10°C    Three months @ -10°C    One year @ -40°C

### Cure Schedules:

Cure Schedule                      15 minutes at 140°C plus 30 minutes at 225°C  
 Alternate Cure Schedules        60 minutes at 180°C  
    10 minutes at 150°C plus 15 minutes at 225°C

### Cured Properties:

<u>Property</u>	<u>Method</u>	<u>Value Obtained</u>
Color	Visual	Cream
Specific Gravity	ASTMD 790	2.1
Volume Resistivity at 25°C, Ohm-cm	ASTMD 257	>2.0 x 10 <sup>14</sup>
Lap Shear Strength to Aluminum at 25°C, psi	ASTMD 1002	1850
Thermal Conductivity, W/m-°K	ASTM E1461	0.9
Thermal diffusivity, thickness = 1.05 mm, cm <sup>2</sup> /s-°K	ASTM E1461	0.0042
Specific Heat Capacity, J/g-°K	ASTM E1461	1.06
Glass Transition, Tan δ peak, °C	DMA	205
Linear Coefficient of Thermal Expansion, x 10 <sup>-6</sup> /°C		
Alpha 1 (below Tg)	ASTME 831	46
Alpha 2 (above Tg)	ASTME 831	220
Weight Loss at 150°C, TGA, 20°C/min, N <sub>2</sub> , %	ASTMD 3850	0.08
at 200°C	and MIL-STD-883	0.15
at 300°C	Section 3.8.5.1	0.47
Space Simulated Outgassing, Total Mass Loss (TML), %	ASTM E595	0.597
Space Simulated Outgassing, Collected Volatiles (CVCM), %	ASTM E595	0.093
Space Simulated Outgassing, Water Vapor Recovered (WVR), %	ASTM E595	0.202

Values reported above are typical values from the recommended cure, and are reported as a means of reference. Individual testing should be done to determine actual results. Data should not be used for material specification purposes.

Rev. 120707PLC

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## Chemical Resistance

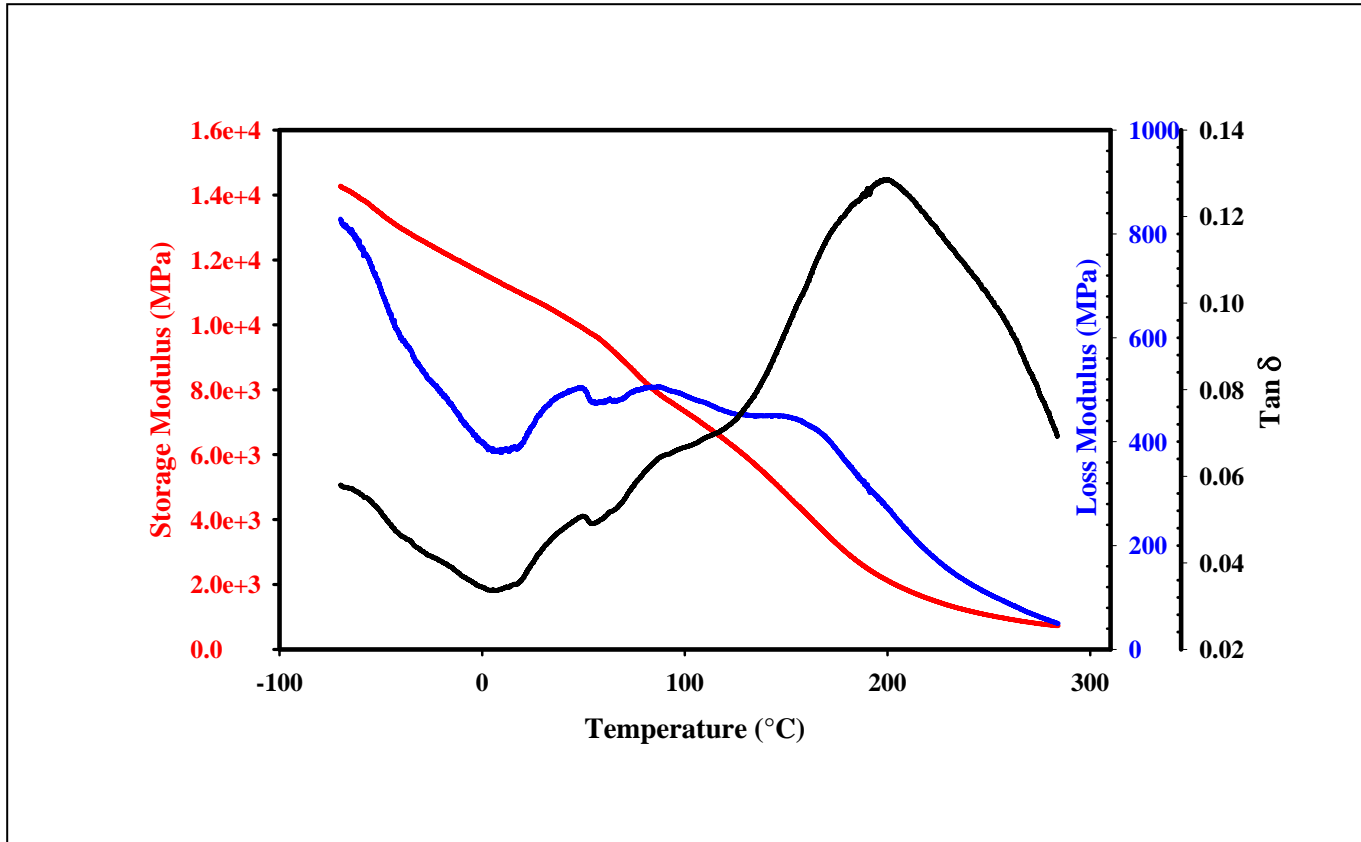
Solvent	Weight Gain (+) Loss (-) after 24 hours at 25°C (%)	Weight Gain (+) Loss (-) after 48 hours at 50°C (%)
Water/antifreeze, 50/50	0.6	2.2
Transmission Fluid	6.0	2.2
Antifreeze	1.2	8.3
Salt Water 1.4M	1.4	0.7
Tap Water	0.7	0.9
Deionized Water	0.8	1.0
Ferric Nitrate/Water , pH2	0.8	0.9
Sodium Hydroxide/Water, pH12	0.8	0.9
Solution of 1 M Methanol, 1M sulfuric Acid, in water	0.7	1.4
N-Methyl-2-pyrrolidone	0.4	0.9
Acetone	0.3	1.3
Isopropyl Alcohol	-0.1	0.2
Alconox® Water, Saturated solution	0.9	2.5
10 to 15 psi Steam, 24 hours at Steam Temperature*	1.4*	-

All samples were 0.005 to 0.007 inches thick, 1 inch wide and 3 inches long. A modified ASTM D570 testing procedure was used. Due to the thin samples used adsorption numbers may be artificially inflated when compared to industrial standards for measuring chemical resistance.

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### DMA Scans



### Modulus Data

Property	Temperature			
	-70°C	-40°C	25°C	100°C
Storage Modulus, MPa	14300	13000	10800	7300
Loss Modulus MPa	830	601	430	490
Tan $\delta$	0.058	0.046	0.040	0.067

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