

RP46

High Temperature Polyimide Composite Resin System

RP46 is a high temperature polyimide composite resin system created by NASA to be a superior replacement for existing polyimide systems. RP46 was developed specifically for the space industry with an operating temperature range from -150°F to +675°F. RP46 also has the ability to withstand hot spikes up to 1,500°F for short periods of time.

RP46 exhibits high mechanical strength and structural durability at elevated temperatures.

RP46 features significantly less moisture absorption and is therefore less susceptible to moisture-induced damage.

RP46 demonstrates excellent thermal oxidative stability and resistance to microcracking.

Neat Resin Properties

Tg: 310°C

Density: 1.32g/cc (cured)

Young's Modulus: 6.09×10^5

Fracture Toughness: $G_{Ic} 235 \text{J/m}^2$

Coefficient of Thermal Expansion: $22.4 \pm 0.01 \times 10^{-6} / ^\circ\text{F}$



RP46 Product features

- Operating Temperature -150°F to +675°F
- High Tg – Carbon Composite 747°F
- Non-MDA (Methylenedianiline)
- Easy to Process
- Low Coefficient of Thermal Expansion:

Carbon Composite: $0.75 \pm 0.01 \times 10^{-6} / ^\circ\text{F}$
- Dielectric Constant - 2.9 @ 10 GHz
- Dissipation Factor – 0.001 @ 10 GHz
- Excellent Chemical, Moisture and Corrosion Resistance
- Significant Cost Advantage



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RP46 Composite Properties

Property	Value for -		Specification
	Unidirectional IM7	Woven Carbon T650-35	
Cure cycle temperature at 200 PSI (1379 KPa) for 2 hr, °F (°C)	600 to 617 (315 to 325)	600 to 617 (315 to 325)	
Postcure temperature for 1 to 4 hr, °F(°C)	660 (349)	660 (349)	
Glass transition temperature (T_g), °F(°C)	740 (393)	747 (397)	TMA
Flexural strength, KSI (MPa) 77°F (25°C) 600 (316) 700 (371) 74 (23) wet ^a 550(288) wet ^a 650(343) wet ^a 650(343)	250 (1724) 133 (917) 115 (793)	167.62 (1156) 119.08 (821) 70.73 (488) 86.98 (600)	ASTM D-790
Interlaminar shear strength, KSI (MPa) 77°F (25°C) 600(316) 700(371) 74 (23) wet ^a 550(288) wet ^a 550(288) 650(343) wet ^a	19 (131) 7.4 (51) 4.7 (32)	9.83 (68) 7.29 (50) 7.12 (49) 4.5 (31)	ASTM D-2344
In-plane, shear strength, KSI (MPa) 77°F (25°C) 550 (288)		15 (103) 11.76 (81)	ASTM D-5379
Tensile strength, Ksi (MPa) at 77°F (25°C)	381 (2627)	88.2 (608)	ASTM D-3039
Compression strength, KSI (MPa) 77°F (25°C) -65 (-54) 77 (25) wet ^a 550 (288) wet ^a 650 (343) wet ^a	261 (1799)	87.68 (604) 85.56 (590) 52.89 (365) 44.11 (304)	ASTM D-695 ASTM D-3410
Interlaminar fracture toughness (G_{Ic}), J/m ² 77°F (25°C) 450 (232) 550 (288) 650 (343)	301 450 740 380		ASTM D-5528 (Double cantilever beam)
Moisture absorption, weight gain % after 30 days at 185°F (85°C) and 85% relative humidity	0.62	0.51	ASTM D-570

^a Specimen exposed to 185°F and 85% relative humidity until saturation before test.

Thermo-oxidative stability, % weight loss after 10,000 hrs at 450°F (232°C) 5,000 hrs at 550 (287) 1,500 hrs at 600 (316) 200 hrs at 700 (371) 100 hrs at 700 (371)	0.9 8.6 7.6 5.58 3.7		Aerospace standard test
Chemical corrosion resistance	No damage after 38 days at 176°F (80°C) immersed in JP-4 and hydraulic fluid. No damage after 6 months submersion under hot asphalt at 450°F (232) to 500°F (260). Excellent resistance to galvanic corrosion, strong acids, and some alkalines.		
Thermal cycling	Better microcracking resistance than a widely used high temperature matrix resin.		ASTM D-635-91
Flammability	Not flammable.		
Burn through	No burn through after 30 sec in blue gas flame at 1.998cm.		
Blistering	No moisture induced thermal damage at 350°F (177°C), 400°F (204), 450°F (232), 500°F (260), and 550°F (288). Minimal damage at 600°F (316).		
Repairability Tensile lap shear strength, PSI (MPa) at 77°F (25°C) PSI at 550°F (288°C)	2450 (16.9) 2100 (14.5)		
Toxicity	Nontoxic Moderate		Ames TA 100 Ames TA 98

Polyimide Prepreg

Unitech, LLC RP46 is an ultra high temperature, high moisture and chemical corrosion resistant polyimide prepreg that cures at 600°F. It is available on unidirectional or woven carbon, glass fibers and fabrics and quartz

Prepreg Physical Properties on Carbon Fibers ^b

Standard weight, g/m..... 108
Standard resin content, percent by weight.. 35 to 38
Standard tack.....both sides
Cured by thickness
IM7 fiber, in (cm).....0.0052 (0.0132)
T650-35 cloth, in (cm).....0.0122 (0.0310)
Shelf life at 0°F, months.....6



^b Other weights, resin contents, fibers, and fabrics are available.