TR1112 TCR Resin System

Technical Data Sheet

TR1112 is a solvent-free, controlled flow epoxy based resin. This prepreg system has a short, 4-hour cure at 93°C, and exhibits controlled exotherm in thick composite parts. TR1112 is ideal for pressure vessel applications utilizing liners comprised of low-melting temperature thermoplastics. TR1112 also demonstrates excellent performance in applications with Type 3 pressure vessels.

Available Prepreg Product Formats
- Tow (roving)
- Woven form/fabric
- Unidirectional tape

Typical Applications
- Low-temperature cure applications
- Plastic lined COPVs (Type 4)
- Aluminum lined COPVs (Type 3)
- Parts requiring high optical clarity

Shelf Life
- 12 months at -18°C (0°F)
- 6 months at 4°C (40°F)
- 1 month at 24°C (75°F)

Benefits/ Features
- Tailored flow and tack levels
- Reduced exotherm in thick laminates and COPVs
- High fiber strength translation in pressure vessel (COPV) applications
- High degree of cure achieved in 4 hours at 93°C
- Short cure cycle time of 60 minutes at 121°C is viable for thin laminates where higher cure temperatures are allowable in the manufacturing process

Cure Conditions
Curing cycle for composite parts <12.7 mm or 0.50 inches in thickness

- Ramp ≤ 2.78°C/min to 93°C (200°F)
- Hold 4 hours at 93°C
- Ramp ≤ 2.78°C/min to ≤ 66°C (150°F)

Thick composite parts (>12.7 mm or 0.50 inches) will require a modified cure cycle. Please contact TCR Composites for more information.

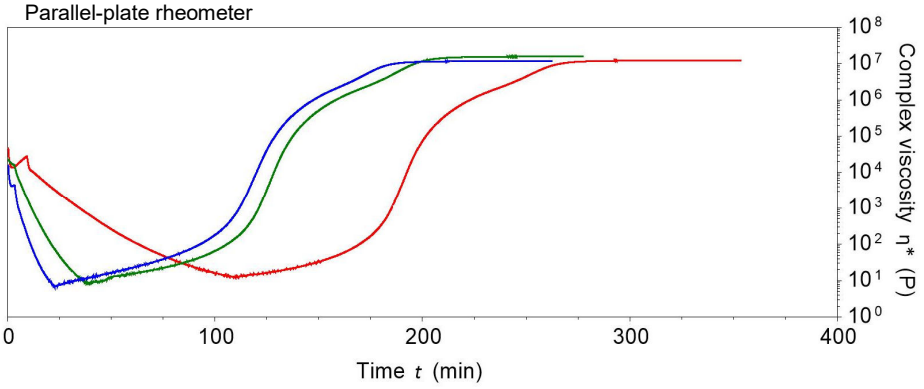
Cured Neat Resin Physical Properties*

Properties	Metric	English	Test Method
Density	1.22 g/cc	0.0433 lbs/in^3	ASTM D 792
Tensile Strength	94.4 MPa	13.7 kpsi	ASTM D 638
Tensile Modulus	3.3 GPa	480 kpsi	ASTM D 638
Strain (% Elongation)	3.3%		ASTM D 638
Poisson's Ratio	0.36		ASTM D 638
Fracture Toughness – K_{IC}	0.580 MPa*m$^{1/2}$	526 psi*in$^{1/2}$	ASTM D 5045
DMA – Dry Glass Transition			
Glass Transition – E" Peak	105 °C	221°F	ASTM E 1640
Glass Transition – E' Onset	103°C	217°F	ASTM E 1640
Glass Transition – Tan δ Peak	125°C	257°F	ASTM E 1640
DMA – Wet Glass Transition**			
Glass Transition – E" Peak	63°C	145°F	ASTM E 1640
Glass Transition – E' Onset	58°C	136°F	ASTM E 1640
Glass Transition – Tan δ Peak	72°C	162°F	ASTM E 1640
Water Absorption**	8.33 %		ASTM D 570

*Cure cycle: 4 hours at 93°C
**DMA wet glass transition and water absorption measured after 24-hour water boil

Resin Cure Viscosity

Parallel-plate rheometer



0.56°C (1°F)/min—Min η*: 12.04 P, 91°C (196°F)

1.67°C (3°F)/min—Min η*: 8.23 P, 93°C (200°F)

2.78°C (5°F)/min—Min η*: 6.54 P, 94°C (°F)

(η*) Time to Viscosity Minimum: {(Min η* Temperature (°C/°F) – (38°C/100°F)} ÷ {(°C/°F)/min}

TCR Composites **219 North 530 West, Ogden, Utah 84404 USA** **1-800-827-3746** **1-801-622-3800**

sales@tcrcomposites.com | www.tcrcomposites.com

Composite Properties

Reinforcement: Standard modulus 12K tow carbon fiber: T700SC-12K-50C.
All composite properties are normalized to 60% fiber volume and expressed to two significant figures.
Cure cycle: 4 hours at 93°C (200°F) via vacuum bag oven cure, tests conducted at 22°C (72°F)

Properties	Metric	English	Test Method
0° Tensile Strength	2.6 GPa	380 kpsi	ASTM D3039
0° Tensile Modulus	150 GPa	22 Mpsi	ASTM D3039
0° Tensile Percent Strain	1.7 %		ASTM D3039
90° Tensile Strength	25 MPa	3.7 kpsi	ASTM D3039
90° Tensile Modulus	8.3 GPa	1.2 Mpsi	ASTM D3039
0° Compressive Strength	1.6 GPa	230 kpsi	SACMA SRM 1R-94
90° Compression Strength	180 MPa	26 kpsi	SACMA SRM 1R-94
Short Beam Strength	76 MPa	11 kpsi	ASTM D2344
Flexural Strength	2.0 GPa	290 kpsi	ASTM D790
Flexural Modulus	110 GPa	16 Mpsi	ASTM D790

Cure Profiles

Option	Ramp Up	Hold Temperature	Hold Time (hours)	Ramp Down
1	≤2.78°C/min (5°F/min)	93°C (200°F)	4	≤2.78°C/min (5°F/min) to 66°C (150°F) or less
2		110°C (230°F)	2.5	
3		121°C (250°F)	1.0	

Note: Option 1 hold temperature of 93°C (200°F) represents the minimum temperature the thickest section of a composite part must achieve to ensure completion of cure. As a result, slightly higher oven temperatures or hold times may be necessary.

All values presented within this technical data sheet are expected ranges based on actual test data. Since values are dependent on specimen preparation and test method, TCR Composites cannot guarantee that these properties will be obtained in all cases. Data should be used only as an indication, since part or component properties are highly dependent on user process and design. It is recommended that end users determine the suitability of this material for each application through their own testing and evaluation.