

PRODUCT DATA SHEET

DESCRIPTION

Toray TC346 is a high temperature epoxy component prepreg developed for structural applications within Formula 1 and high performance automotive. Toray TC346 is designed to deliver enhanced compression properties to manufactured parts while maintaining a good fracture toughness. When exposed to elevated temperature environments, TC346 composites demonstrate excellent retention of mechanical performance.

FEATURES

- ▶ **T_g 208°C (406°F) after 180°C (356°F) cure cycle**
- ▶ **Structural system—mechanical performance optimized for compression, short-beam shear, fracture toughness**
- ▶ **Excellent retention of properties at elevated temperatures**
- ▶ **Toughened system—good interlaminar fracture toughness energy achieved without significant compromise of compression properties**
- ▶ **Controlled tack level to aid laminating**
- ▶ **Controlled resin flow during recommended cure cycle**
- ▶ **21-day out life at 20°C (68°F)**
- ▶ **12-month storage life at -18°C (0°F)**

PRODUCT TYPE

135°C (275°F) to 180°C (356°F) Cure High Temperature Epoxy Component Prepreg

TYPICAL APPLICATIONS

- ▶ Structural applications within Formula 1 and high performance automotive

SHELF LIFE

Out Life:	21 days at 20°C (68°F)
Storage Life:	12 months at -18°C (0°F)

Out life is the maximum time allowed at room temperature before cure.

To avoid moisture condensation

Following removal from cold storage, allow the prepreg to reach room temperature before opening the polythene bag. Typically, the thaw time for a full roll of material will be 4 to 6 hours.

TYPICAL NEAT RESIN PROPERTIES

Density (ASTM D792)	1.3 g/cm ³ (81.2 lbs/ft ³)
T _g (DMA) after 2 hrs at 180°C (356°F) (ASTM D7028)	Onset: 208°C (406°F); Peak tan δ: 228°C (442°F)
T _g (DMA) after 2 hrs at 200°C (392°F) post cure (ASTM D7028)	Onset: 221°C (430°F); Peak tan δ: 236°C (457°F)
T _g (DMA) after 3 hrs at 135°C (275°F) (ASTM D7028)	Onset: 156°C (313°F); Peak tan δ: 178°C (352°F)



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TYPICAL LAMINATE PROPERTIES

Intermediate Modulus 6K Carbon 200gsm 2x2 Twill 42% RC			
Property	Method	Test Temperature	
		RTD (Vf 52.6%)*	RTD Normalized to 55% Vf
Tensile Strength 0°	BS EN ISO 527-4	1034 MPa	1081 MPa
Tensile Modulus 0°	BS EN ISO 527-4	72.1 GPa	72.3 GPa
Poisson's Ratio 0°	BS EN ISO 527-4	0.04	-
Tensile Strength 90°	BS EN ISO 527-4	956 MPa	1000 MPa
Tensile Modulus 90°	BS EN ISO 527-4	72.7 GPa	76.0 GPa
Poisson's Ratio 90°	BS EN ISO 527-4	0.04	-
Compression Strength 0°	prEN 2580	910 MPa	952 MPa
Compression Modulus 0°	prEN 2580	65.4 GPa	68.3 GPa
Compression Strength 90°	prEN 2580	866 MPa	906 MPa
Compression Modulus 90°	prEN 2580	62.0 GPa	64.8 GPa
In-Plane Shear Strength	ASTM D 3518 M	148 MPa	-
In-Plane Shear Modulus	ASTM D 3518 M	4.70 GPa	-
Poisson's Ratio	ASTM D 3518 M	0.78	-
Interlaminar Shear Strength 0°	ASTM D 2344 M	105.6 MPa	-
Interlaminar Shear Strength 90°	ASTM D 2344 M	105.7 MPa	-
Mode I Interlaminar Fracture Toughness (G _{IC} Strain Energy Release Rate)	prEN 6033	935 J/m ²	-

IM7 fiber
Cured 2 hrs at 180°C (356°F) at 2°C/min 90 psi autoclave cure cycle
*Data is average of 2 batches

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TYPICAL LAMINATE PROPERTIES

High Modulus M46JB 12K Carbon 140gsm UD 34% RC			
Property	Method	Test Temperature	
		RTD (VF 62.1%)	RTD Normalized to 60% Vf
Tensile Strength 0°	BS EN ISO 527-4	1906 MPa	1842 MPa
Tensile Modulus 0°	BS EN ISO 527-4	258.9 GPa	250.1 GPa
Poisson's Ratio 0°	BS EN ISO 527-4	0.30	-
Tensile Strength 90°	BS EN ISO 527-4	35 MPa	-
Tensile Modulus 90°	BS EN ISO 527-4	7.4 GPa	-
Poisson's Ratio 90°	BS EN ISO 527-4	0.00	-
Compression Strength 0°	prEN 2580 Type B	1057 MPa	1021 MPa
Compression Modulus 0°	prEN 2580 Type B	229.9 GPa	222.1 GPa
Compression Strength 90°	prEN 2580 Type B	256 MPa	-
Compression Modulus 90°	prEN 2580 Type B	7.7 GPa	-
In-Plane Shear Strength	ASTM D 3518 M	66 MPa	-
In-Plane Shear Modulus	ASTM D 3518 M	4.8 GPa	-
Poisson's Ratio	ASTM D 3518 M	0.80	-
Interlaminar Shear Strength 0°	ASTM D 2344 M	95.4 MPa	-
Flexural Strength 0°	BS EN ISO 14125	1650 MPa	1594 MPa
Flexural Modulus 0°	BS EN ISO 14125	234 GPa	226.1 GPa
Mode I Interlaminar Fracture Toughness (G _{IC} Strain Energy Release Rate)	prEN 6033	193 J/m ²	-

Cured 2 hrs at 180°C (356°F) at 2°C/min 90 psi autoclave cure cycle

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High Modulus M46JB 6K Carbon 200gsm 2x2 Twill 38% RC			
Property	Method	Test Temperature	
		RTD (VF 55.65%)	RTD Normalized to 55% Vf
Tensile Strength 0°	BS EN ISO 527-4	596 MPa	589 MPa
Tensile Modulus 0°	BS EN ISO 527-4	109.6 GPa	108.3 GPa
Poisson's Ratio 0°	BS EN ISO 527-4	0.01	-
Tensile Strength 90°	BS EN ISO 527-4	529 MPa	522.8 MPa
Tensile Modulus 90°	BS EN ISO 527-4	103.7 GPa	102.5 GPa
Poisson's Ratio 90°	BS EN ISO 527-4	0.02	-
Compression Strength 0°	prEN 2580 Type B	526 MPa	519.9 MPa
Compression Modulus 0°	prEN 2580 Type B	101.1 GPa	99.9 GPa
Compression Strength 90°	prEN 2580 Type B	493 MPa	487.2 MPa
Compression Modulus 90°	prEN 2580 Type B	97.1 GPa	96.0 GPa
In-Plane Shear Strength	ASTM D 3518 M	102 MPa	-
In-Plane Shear Modulus	ASTM D 3518 M	4.47 GPa	-
Poisson's Ratio	ASTM D 3518 M	0.90	-
Interlaminar Shear Strength 0°	ASTM D 2344 M	74.3 MPa	-
Interlaminar Shear Strength 90°	ASTM D 2344 M	75.6 GPa	-
Mode I Interlaminar Fracture Toughness (G _{IC} Strain Energy Release Rate)	prEN 6033	503 J/m ²	-

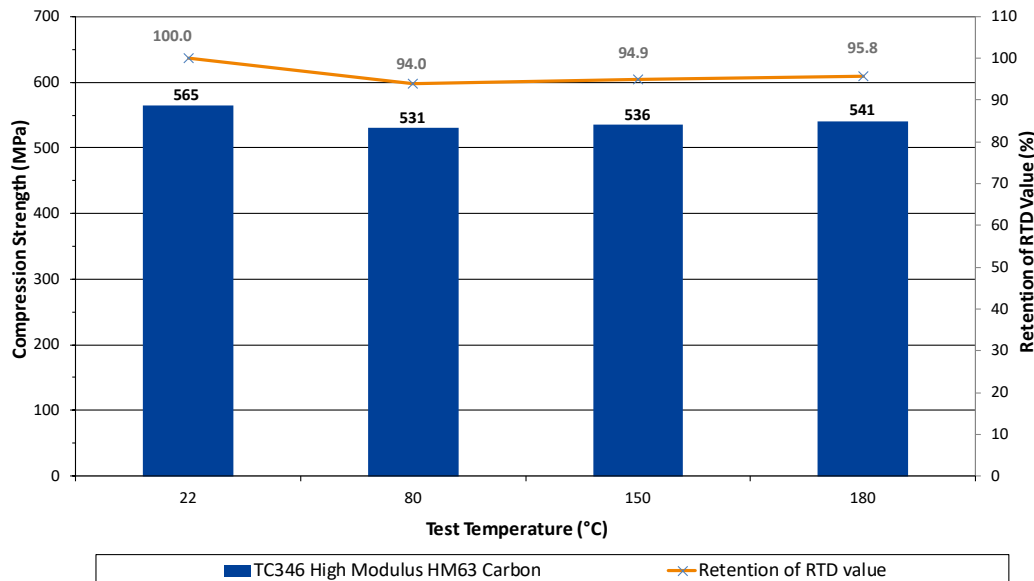
Cured 2 hrs at 180°C (356°F) at 2°C/min 90 psi autoclave cure cycle

RETENTION OF MECHANICAL PROPERTIES AT ELEVATED TEMPERATURES

Elevated Temperature Dry (ETD) Cured 2 Hours at 180°C (356°F) at 2°C/min at 90 psi

ETD Compression Strength vs. Test Temperature

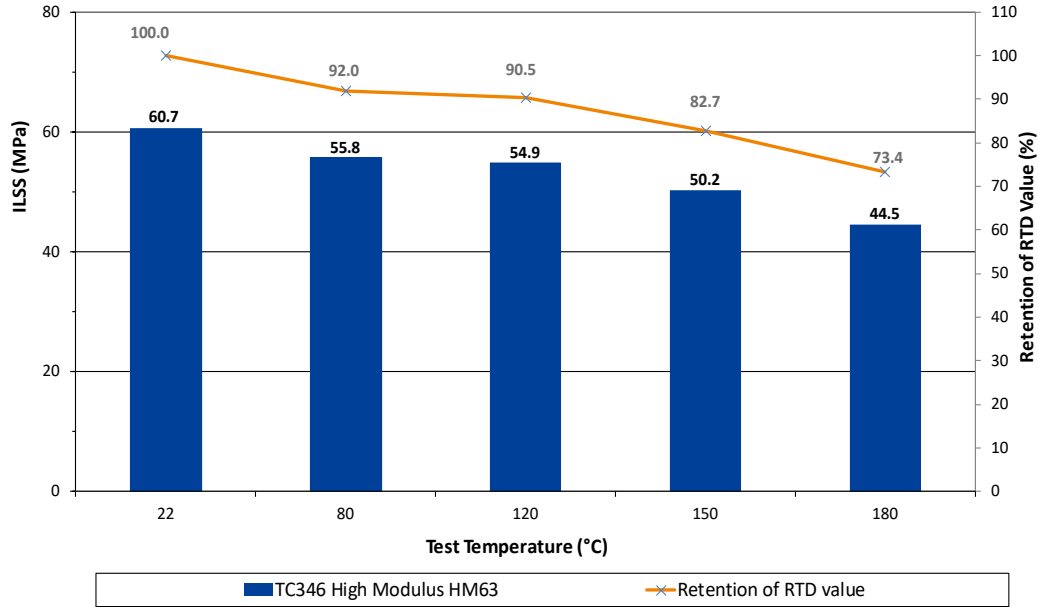
High Modulus 12K Carbon 285gsm 5HS 42% RC TC346 Laminate



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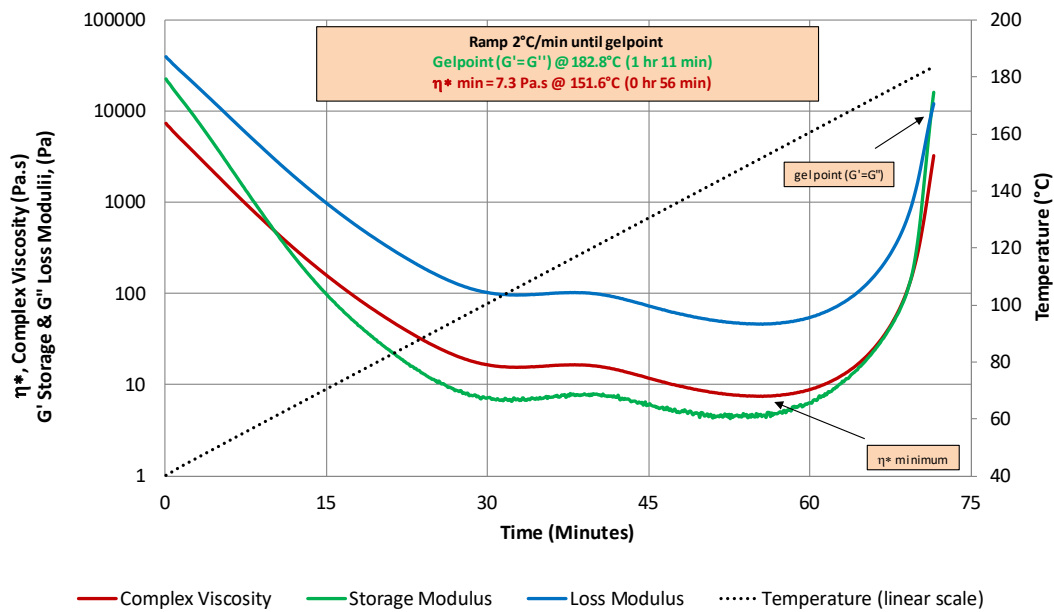
ETD ILSS vs. Test Temperature

High Modulus 12K Carbon 285gsm 5HS 42% RC TC346 Laminate



RHEOLOGY

2°C/min until Gelpoint: Amplitude=0.001rad



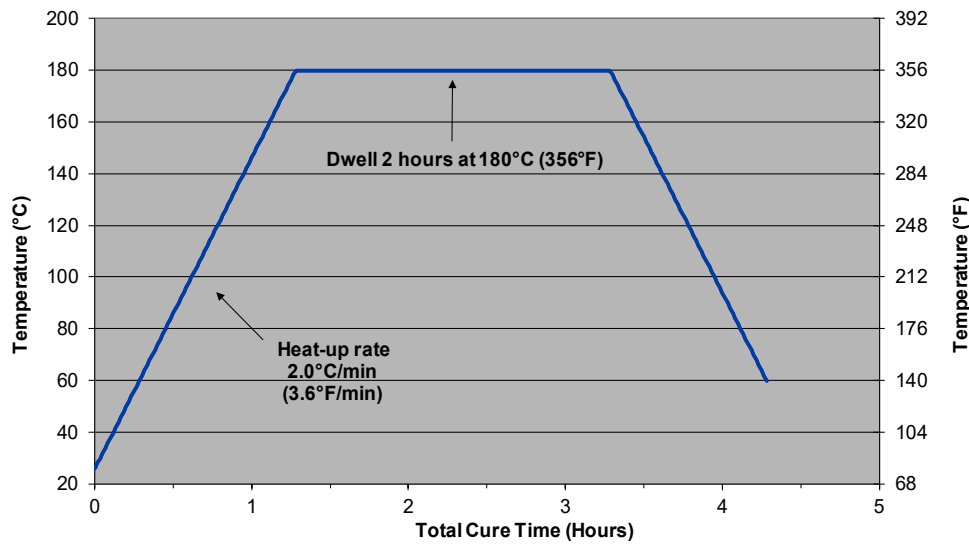
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TYPICAL CURE PROFILE

180°C (356°F) Cure Temperature with 90 psi Pressure		
Ramp	2.0°C (3.6°F)/min to 180°C (356°F)	Dwell for 2 hours
Cool	2.0°C (3.6°F)/min to 60°C (140°F)	Followed by demold
Total time: 4 hours 30 minutes		

CURE SCHEDULE

Initial Minimum 180°C Cure Schedule



A 60-minute dwell at 107°C (225°F) may be also be used.
 An alternative cure cycle at 135°C (275°F) may be used followed by a 180°C (356°F) freestanding post cure.

135°C (275°F) Cure Temperature with 90 psi Pressure		
Ramp	2.0°C (3.6°F)/min to 135°C (275°F)	Dwell for 3 hours
Cool	2.0°C (3.6°F)/min to 60°C (140°F)	Followed by demold
Followed by freestanding post cure for 2 hours at 180°C (356°F)		
Total time: 4 hours 40 minutes		

Alternative cure cycles and molding techniques may be employed. Please consult our technical support engineers for advice on your specific cure requirements.

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EXOTHERM

In certain circumstances, such as the production of thick section laminates rapid heat-up rates or highly insulating masters, Toray TC346 can undergo exothermic heating leading to rapid temperature rise and component degradation in extreme cases. Where this is likely, a cure incorporating an intermediate dwell is recommended in order to minimize the risk.

HANDLING SAFETY

Observe established precautions for handling epoxy resins and fibrous materials—wear gloves. For further information, refer to the Safety Data Sheet.

PROCESSING

Following removal from refrigerated storage, allow the prepreg to reach room temperature before opening the polythene bag, to avoid moisture condensation. Typically, the thaw time for a full roll of material will be 4 to 6 hours. Cut patterns to size and lay-up the laminate in line with design instructions taking care not to distort the prepreg. If necessary, the tack of the prepreg may be increased by gentle warming with hot air. The lay-up should be vacuum debulked at regular intervals using a P3 (pin pricked) release film on the prepreg surface; a vacuum of 948 mbar (28 in Hg) is applied for 10 minutes.

For autoclave cures, use of a nonperforated release film on the prepreg surface trimmed to within 25–30 mm of the prepreg edge is recommended for the cure cycle and a vacuum bag should be installed using standard techniques.