

PRODUCT DATA SHEET

DESCRIPTION

Toray 8020-FR is a modified epoxy resin system suitable for curing between 70°C (158°F) and 120°C (248°F). The medium viscosity resin is pre-impregnated into high performance fibers such as carbon, glass and aramid. Toray 8020-FR offers excellent structural properties, flame retardance and toughness. Toray 8020-FR is designed for structural applications in the motor racing, general industrial fabrications and marine industries and is suitable for a wide range of engineering applications.

FEATURES

- ▶ The resin system used in Toray 8020-FR is fire resistant under FAR25.853 Appendix F- vertical burn material test criteria (i)
- ▶ Flexible low to medium cure schedules 70°C (158°F) to 120°C (248°F)
- ▶ 30 days shelf life at ambient temperature
- ▶ Excellent drape—complex shapes easily formed
- ▶ Good adhesive properties—ideal for honeycomb sandwich construction without the use of a resin film
- ▶ Medium out level—easily laminated onto mold surface
- ▶ Controlled flow—excellent surface finish
- ▶ Low volatile content—no solvents used during processing

PRODUCT TYPE

70°C (158°F) to 120°C (248°F) Cure

Flexible Cure, Flame Retardant, Toughened Epoxy Resin System

TYPICAL NEAT RESIN PROPERTIES

Density	1.35 g/cm ³ at 23°C (74°F)
T _g (DMTA) after 1 hour at 120°C (248°F)	Onset: 121°C (250°F); Peak tan δ: 138°C (280°F)

TYPICAL APPLICATIONS

Structural applications in:

- ▶ Motor racing
- ▶ General industrial applications
- ▶ Marine industries
- ▶ Wide range of engineering applications

SHELF LIFE

Out Life:	30 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.



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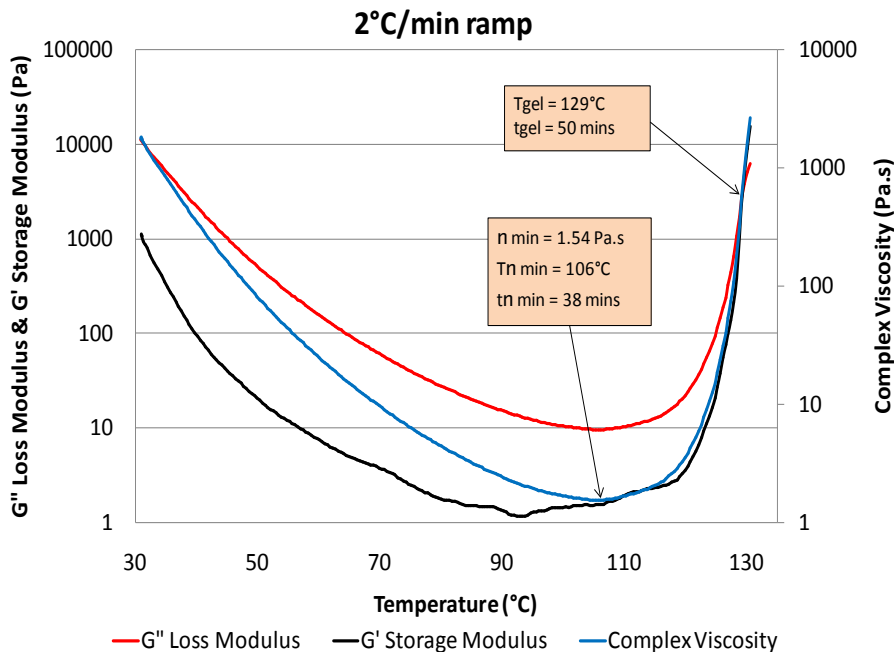
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TYPICAL LAMINATE PROPERTIES

HS0838 – Carbon 205 gsm 2x2 Twill TR30S T 3k - 0/90° Configuration Woven Laminates				
Property	Condition	Method	Results	
Tensile Strength 0°	RTD	ISO 527-4	935 MPa	136 ksi
Tensile Modulus 0°	RTD	ISO 527-4	68.6 GPa	9.9 Msi
Tensile Strength 90°	RTD	ISO 527-4	876 MPa	127 ksi
Tensile Modulus 90°	RTD	ISO 527-4	67.4 GPa	9.8 Msi
Poisson's Ratio	RTD		0.04	
Compression Strength 0°	RTD	EN 2580	674 MPa	98 ksi
Compression Modulus 0°	RTD	EN 2580	62.5 GPa	9.1 Msi
Compression Strength 90°	RTD	EN 2580	636 MPa	92 ksi
Compression Modulus 90°	RTD	EN 2580	60.3 GPa	8.7 Msi
In-Plane Shear Strength	RTD	ISO 14129	80 MPa	12 ksi
In-Plane Shear Modulus	RTD	ISO 14129	3.9 GPa	0.6 Msi
Interlaminar Shear Strength 0°	RTD	ISO 14130	63 MPa	9 ksi
Interlaminar Shear Strength 90°	RTD	ISO 14130	62 MPa	9 ksi

Cured 5½ hours at 80°C (176°F)
 Actual 48.3% Vf
 *Results normalized to 55% Vf

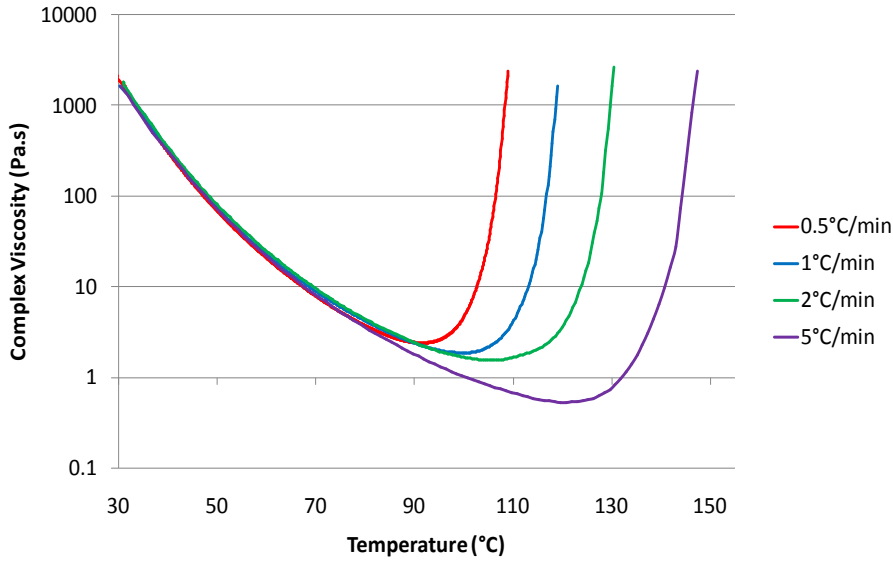
RHEOLOGY



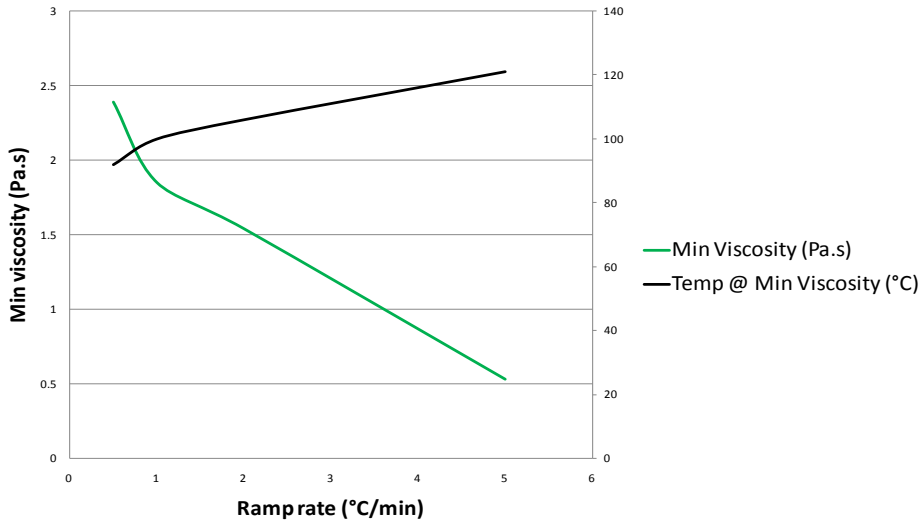
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VISCOSITY

Viscosity Profiles



Ramp rate vs viscosity plot



CURE PROPERTIES: VISCOSITY PROFILE (30°C TO 150°C OR 86°F TO 302°F)

Ramp rate [°C(°F)/min]	Minimum Viscosity (Pa.s)	Temperature at Minimum Viscosity
0.5 (1.0)	2.39	92°C (198°F)
1.0 (1.8)	1.85	100°C (212°F)
2.0 (3.6)	1.54	106°C (223°F)
5.0 (9.0)	0.53	121°C (250°F)

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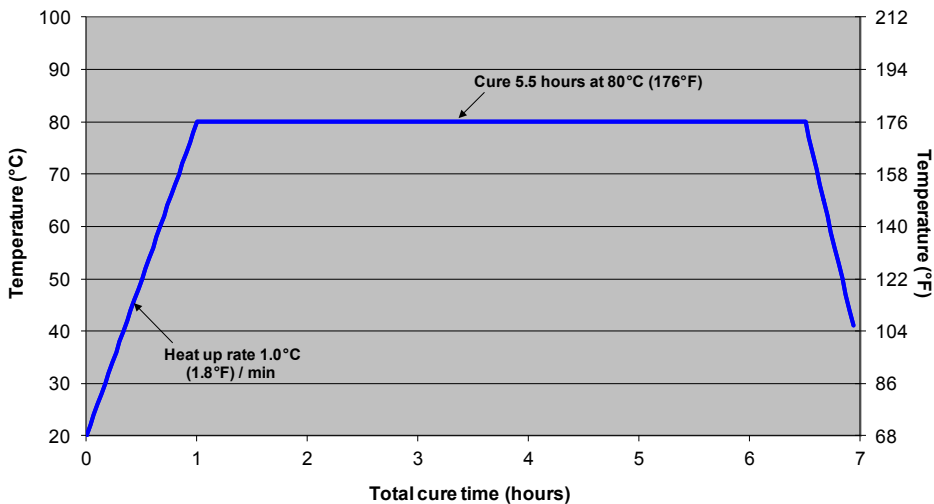
CURING CYCLES

Increase autoclave pressure to 1.4bar (20psi) with vacuum applied (29 in Hg). Vent to atmosphere and raise pressure to 6.2bar (90psi) (or maximum allowed by core material).

Increase air temperature at 2°C (3.6°F)/min to the required dwell temperature (see table and graph on next page). Dwell for the recommended time period and cool to 60°C (140°F) prior to removal of the pressure.

To obtain the maximum T_g it is essential that a suitable postcure is carried out. E.g., ramp from the cure dwell temperature to 120°C (248°F) at 20°C (36°F)/hour and hold for 1 hour minimum. Cool to 60°C (140°F) at 3°C (5.4°F) per minute. This will produce a laminate with T_g 121°C (250°F) (DMTA Onset).

INITIAL MINIMUM 80°C CURE SCHEDULE



RECOMMENDED CURE TIMES

Cure Temperature	Recommended Dwell Times
70°C (158°F)	12.0 hours
80°C (176°F)	5.5 hours
100°C (212°F)	2.0 hours
120°C (248°F)	1.0 hour

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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 8020-FR 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 Safety Data Sheet.

PROCESSING

Toray 8020-FR can be successfully molded by vacuum bag, autoclave or matched die molding techniques.

Following removal from refrigerated storage, allow the prepreg to reach room temperature before opening the polythene bag, to avoid moisture condensation. 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; vacuum of 980 mbar (29 in Hg) is applied for 20 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.