Toray E650

Toray Advanced Composites

PRODUCT DATA SHEET

DESCRIPTION

Toray E650 is a low temperature curing toughened resin system pre-impregnated into high performance fibers such as carbon, glass and aramid. It is designed for the production of composite structures in the leisure and sporting industries and also for a range of engineering applications. Toray E650 is compatible for co-cure with a range of Toray MicroPly™ film adhesive and syntactic core products.

FEATURES

- **Low initial cure temperature 50°C to 80°C (122°F to 176°F)**
- **Medium tack level, easily laminated to mold surface**
- **Excellent drape—complex shapes easily formed**
- **5-day shelf life at ambient temperature**
- **Good quality surface finish under vacuum bag conditions**
- **Suitable for processing by autoclave, press molding, and vacuum bag cure**
- **Low volatile content—no solvents used during processing**

PRODUCT TYPE

50–80°C (122–176°F) Cure
Low Temperature Curing Toughened Epoxy Component Prepreg

TYPICAL APPLICATIONS

- Production of composite structures in the leisure and sporting industries
- Range of engineering applications

SHELF LIFE

Out Life:	5 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	1.2 g/cm^3 (74.9 lbs/ft^3) at 23°C (73.4°F)
T_g (DMTA) after 4 hours post cure at 140°C (284°F)	Onset: 121°C (250°F) Peak tan δ: 133°C (271°F)

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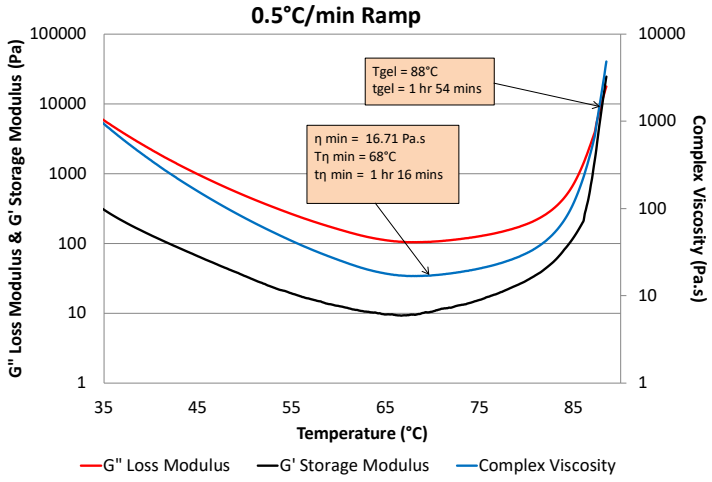
MECHANICAL PROPERTIES

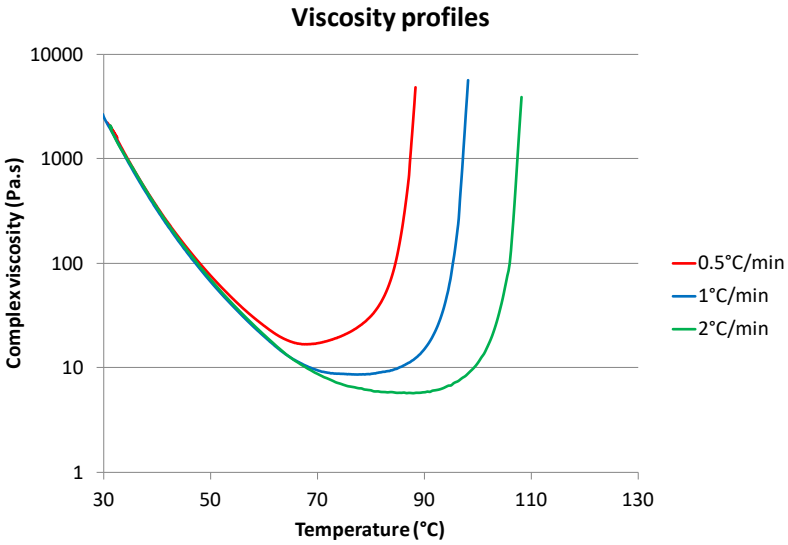
Standard Modulus FT300B 40B 3K Carbon 205gsm 2x2 Twill				
Property	**Condition**	**Method**	**Laminate**	
Tensile Strength 0°	RTD	ISO 527-4	689 MPa	100 ksi
Tensile Modulus 0°	RTD	ISO 527-4	61.2 GPa	8.9 Msi
Tensile Strength 90°	RTD	ISO 527-4	708 MPa	103 ksi
Tensile Modulus 90°	RTD	ISO 527-4	59.6 GPa	8.6 Msi
Poisson's Ratio*	RTD		0.05	
Compressive Strength 0°	RTD	EN 2580	713 MPa	103 ksi
Compressive Modulus 0°	RTD	EN 2580	58.1 GPa	8.4 Msi
Compressive Strength 90°	RTD	EN 2580	652 MPa	95 ksi
Compressive Modulus 90°	RTD	EN 2580	60.3 GPa	8.7 Msi
In-Plane Shear Strength*	RTD	ISO 14129	89 MPa	13 ksi
In-Plane Shear Modulus*	RTD	ISO 14129	3.34 GPa	0.5 Msi
Interlaminar Shear Strength 0°*	RTD	ISO 14130	57 MPa	8 ksi
Interlaminar Shear Strength 90°*	RTD	ISO 14130	57 MPa	8 ksi

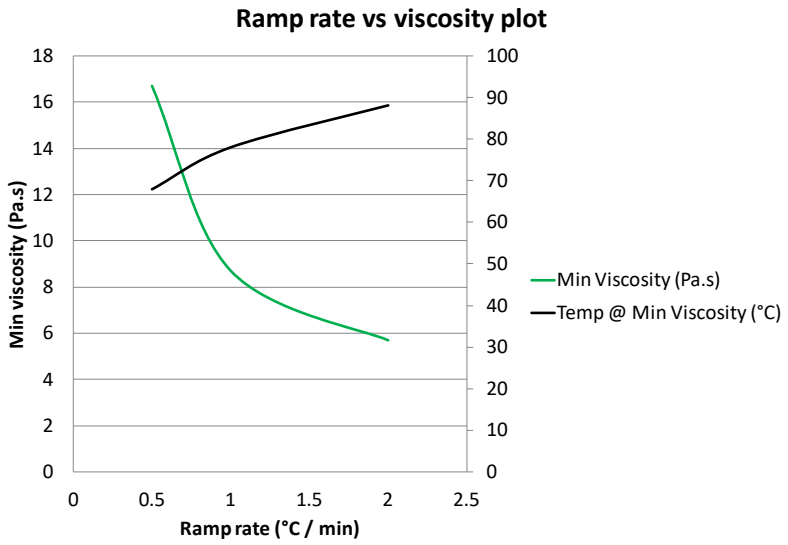
0/90° configuration woven laminates
Cured 3.5 hours at 70°C (158°F)
Data is normalized to 55% Vf except * as tested to 48.3% Vf

RHEOLOGY



VISCOSITY

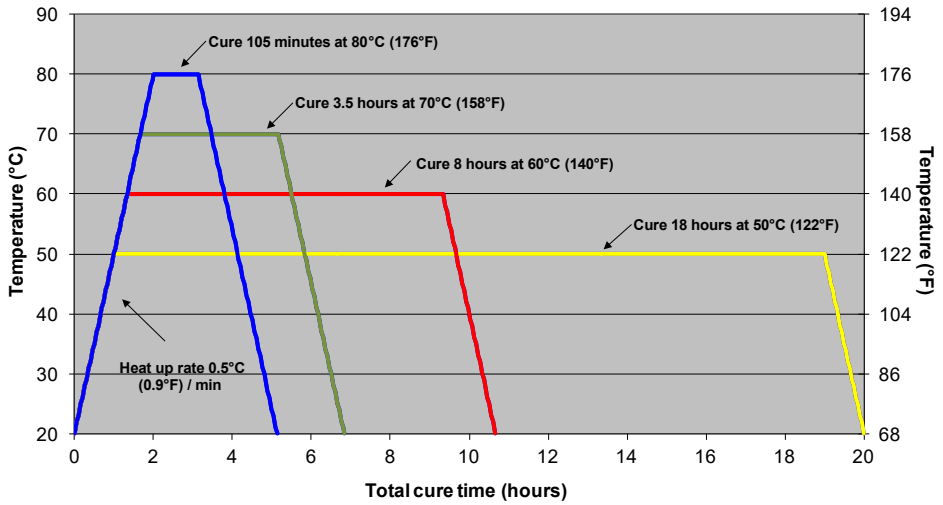




CURE PROPERTIES: VISCOSITY PROFILE (30°C TO 110°C OR 86°F TO 230°F)

Ramp rate [°C(°F)/min]	Minimum Viscosity (Pa.s)	Temperature at Minimum Viscosity
0.5 (1.0)	16.71	68°C (154°F)
1.0 (1.8)	8.71	78°C (172°F)
2.0 (3.6)	5.7	88°C (190°F)

INITIAL MINIMUM CURE SCHEDULE



RECOMMENDED CURE TIMES

Cure Temperature	Recommended Dwell Times
50°C (122°F)	18 hours
60°C (140°F)	8 hours
70°C (158°F)	3.5 hours
80°C (176°F)	105 mins

POST CURE

- In applications demanding maximum temperature or environmental resistance, it is essential to develop the glass transition temperature to the maximum level by a suitable post cure
- Ramp from initial cure temperature to 140°C (284°F) at 20°C (36°F)/hr and hold for 4 hours minimum. This post cure will result in a T_g (peak tan δ) of approximately 133°C (271°F)
- Laminates may be post cured unsupported unless the size, shape, and laminate thickness would allow excessive distortion under self-weight

EXOTHERM

In certain circumstances, such as the production of thick section laminates rapid heat-up rates or highly insulating masters, Toray E650 prepreg can undergo exothermic heating leading to rapid temperature rise and component degradation in extreme cases. The risk of exotherm increases with lay-up thickness and increasing cure temperature.

It is strongly recommended that trials, representative of all the relevant circumstances, are carried out by the user to allow a safe cure cycle to be specified.

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, to avoid moisture condensation, allow the prepreg to reach room temperature before opening the polythene bag.

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 (pinpricked) release film on the prepreg surface; vacuum of 980 mbar (29 inHg) is applied for 20 minutes.

Toray E650 can be successfully molded by vacuum bag, autoclave, or matched die molding techniques.

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