Toray BT250E-1

Toray Advanced Composites

PRODUCT DATA SHEET

DESCRIPTION

Toray BT250E-1 resin system is a 121°C (250°F) cure epoxy prepreg system with excellent toughness and strength. It provides an outstanding surface finish under vacuum-bag/oven-cure only. The resin system, which is self-adhesive to honeycomb and foam core, is MIL-R-9300 qualified and makes a great choice for many applications in the low-to-medium-service temperature range.

FEATURES

- **Excellent system for out of autoclave cure**
- **Toughened for good impact resistance**
- **MIL-R-9300 qualified**
- **Ideal for low-to-medium service temperature applications**

PRODUCT TYPE

121°C (250°F) Cure, Epoxy Prepreg System

TYPICAL APPLICATIONS

- Secondary aircraft structures
- Radomes with glass, quartz, and Kevlar®
- Reflectors
- Sporting goods
- Knee braces and other related medical items
- General purpose composites

SHELF LIFE

Tack Life:	Up to 30 days at ambient
Out Life:	Up to 30 days at ambient
Frozen Storage Life:	12 months at -18°C (< 0°F)

Tack life is the time during which the prepreg retains enough tack, drape, and handling for component lay-up.

Out life is the maximum time allowed at ambient temperature before cure. *Ambient is 18–22°C (65–72°F)

**Out life tested by SBS on 8-ply 15 x 15 cm (6 x 6") fabric laminate, cured in an out-of-autoclave/vacuum-bag only (OOA/VBO) environment with 914–948 mbar (27–28 inHg). Users may need to separately evaluate out life limits on thicker, larger, and more complex parts.*

TYPICAL NEAT RESIN PROPERTIES

Density	1.17 g/cc
T_g	125°C (257°F)
Dielectric Constant	3.0 at 10 GHz
Loss Tangent	0.019 at 10 GHz
Moisture Absorption	2.0% after 24 hr water boil

Tensile Strength	75 MPa (10.9 ksi)
Tensile Modulus	3 GPa (0.44 Msi)
Tensile Strain	2.5%
Compression Strength	115 MPa (16.7 ksi)
Compression Modulus	2.8 GPa (0.4 Msi)
Flexural Strength	156 MPa (22.6 ksi)
Flexural Modulus	3.4 GPa (0.50 Msi)
Flexural Strain	5.5%

CTE	71 ppm/°C (39 ppm/°F)
Dielectric Constant at 10 GHz on 4581 quartz	3.26
Loss Tangent at 10 GHz on 4581 quartz	0.0081

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ELECTRICAL PROPERTIES OF COMPOSITE LAMINATES

BT250E-1 (7781 Fg)	C/X Band 8–18 GHz	Ku/K Band 18–26.5 GHz	Ka Band 26.5–40 GHz	Q & U Band 40–60 GHz
Dielectric Constant	4.52	4.48	4.45	4.42
Loss Tangent	0.019	0.018	0.017	0.016

MECHANICAL PROPERTIES

Property	Condition	Methods	Results	
Tensile Strength 0°	RTD	ASTM D 3039	502 MPa	73 ksi
Tensile Modulus 0°	RTD	ASTM D 3039	24.5 GPa	3.6 Msi
Compressive Strength 0°	RTD	ASTM D 3410	485 MPa	70 ksi
Compressive Modulus 0°	RTD	ASTM D 3410	24.8 GPa	3.6 Msi
Flexural Strength 0°	RTD	ASTM D 7264	602 MPa	87 ksi
Flexural Modulus 0°	RTD	ASTM D 7264	21.6 GPa	3.1 Msi
Short Beam Shear Strength	RTD	ASTM D 2344	62.3 MPa	9.0 ksi

Laminate data - 7781 Fg reinforcement, 300gsm FAW.
* All properties normalized to 60% fiber volume except ILSS. (Fiber volume 40–50%)

MECHANICAL PROPERTIES

Property	Condition	Methods	Results A		Results B	
Tensile Strength 0°	RTD	ASTM D 3039	767 MPa	112 ksi	797 MPa	116 ksi
Tensile Modulus 0°	RTD	ASTM D 3039	57.3 GPa	8.3 Msi	59.0 GPa	8.6 Msi
Compressive Strength 0°	RTD	ASTM D 3410	518 MPa	75 ksi	570 MPa	83 ksi
Compressive Modulus 0°	RTD	ASTM D 3410	55.2 GPa	8.0 Msi	57.7 GPa	8.4 Msi
Flexural Strength 0°	RTD	ASTM D 7264	752 MPa	109 ksi	790 MPa	115 ksi
Flexural Modulus 0°	RTD	ASTM D 7264	51.2 GPa	7.4 Msi	53.6 GPa	7.8 Msi
Short Beam Shear Strength	RTD	ASTM D 2344	61.9 MPa	9.0 ksi	63.5 MPa	9.2 ksi

(A) Laminate data - 3K PW graphite, 250gsm FAW.
(B) Laminate data - 3K 8HS graphite laminate, 368gsm FAW.
*All properties normalized to 60% fiber volume except ILSS. (Fiber volume 40–50%)

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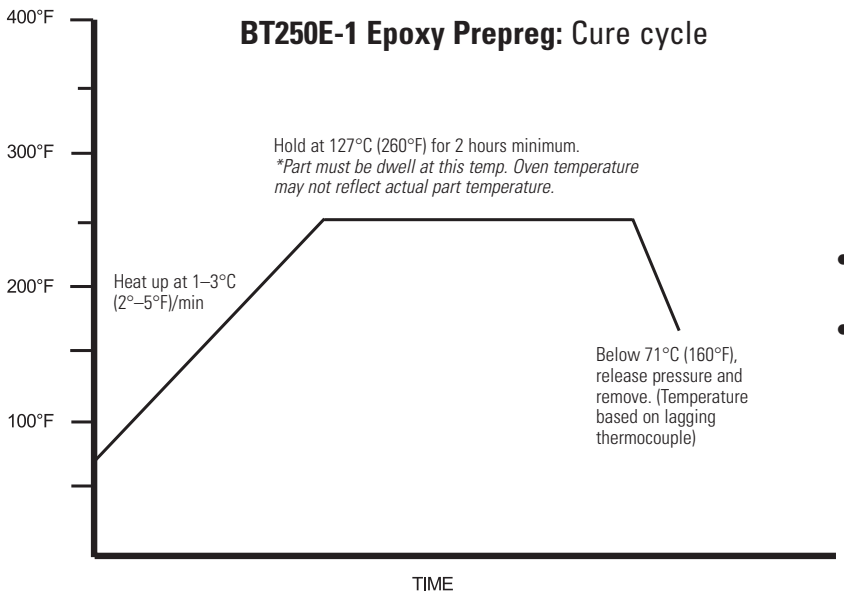
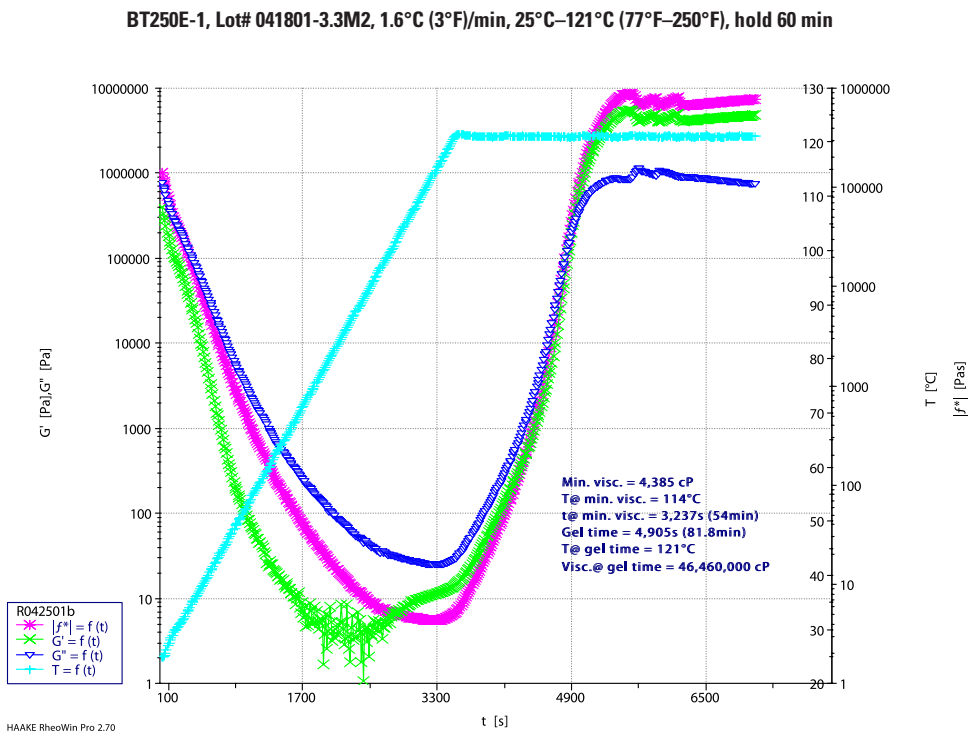


- Apply 25 inHg vacuum minimum.
- Apply 1–3.4 bar, 30–100 psi pressure to autoclave (optional).



EPOXY PREPREG, ADHESIVE, AND RESIN GUIDELINES AND HANDLING PROCEDURES

The following guidelines are provided to our customers to assure that best practices are used to attain the best results from Toray Advanced Composites epoxy products. Keep in mind that these procedures represent best practices for all composite prepreg and adhesive materials.

FREEZER STORAGE

Epoxy resin materials have good shelf life at room temperature; however, the life and performance of the material is best preserved with the following basic guidelines. Refer to the shelf life included in the product certifications. The epoxy material should be sealed in an airtight bag and kept frozen below -18°C (0°F) when not being used for longest life and most consistent performance. A good safety measure is to have a bag of desiccant (silica moisture absorber) in the core of the prepreg roll to assure the best protection from moisture ingression.

MOISTURE ABSORPTION AND SENSITIVITY

While very resistant to moisture absorption after cure, epoxies can be adversely affected by moisture uptake prior to cure. For this reason, all materials must be completely thawed to room temperature prior to opening the sealed bag to avoid condensation on the material. Also, it is good practice to keep prepreg and in-process hardware in a sealed bag or vacuum bag if it will be exposed to the atmosphere for long periods of time.

HANDLING OF MATERIALS

When handling any prepreg materials, one should always wear clean, powder-free latex gloves. This will assure that no hand oils are transferred to the prepreg and/or composite during processing. The presence of oils in the part could lead to problems in both mechanical and electrical performance of the part. This also guards against dermatitis that may occur with some users.

NONMETALLIC HONEYCOMB AND FOAM CORE USE

When using nonmetallic honeycomb and foam core materials for sandwich structures, the materials should always be dried in an oven prior to lay-up to drive off any moisture that may be in the core. The core should be cooled in the presence of a desiccant to avoid moisture uptake. Following drying, it is always best to use the material as soon as possible. Recommended core dry time/temp: 121°C (250°F) for 3–4 hours.

DEBULK LAY-UP MATERIAL SEQUENCE FROM TOOL SURFACE TO BAGGING MATERIALS

1. Bottom Tool
2. Non-porous FEP
3. Prepreg
4. Porous TX1040
5. Non-porous FEP
6. Caul plate
7. Breather (woven or thick breather)
8. Vacuum bag
9. Repeat above procedure

A robust debulking procedure is necessary to minimize entrapped air between plies as shown in Figure 1. Vacuum level should be at least at 27 inHg. BT250E-1 was debulked at ambient every 4 plies for 5–10 minutes. An additional ply of porous Teflon coated glass (TX1040) was used to help with the removal of entrapped air, and it was replaced every 2–3 cycles.

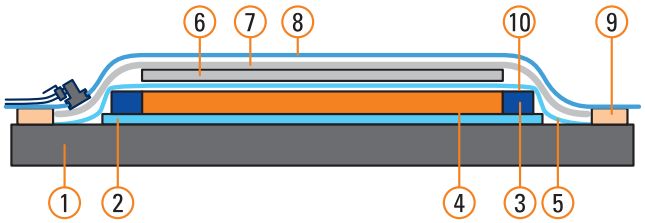
TYPICAL COMPOSITE LAMINATE STACKING SEQUENCE

List of Materials

1. Tool – aluminum, steel, Invar, composite (tool plates must be release coated or film covered).
2. Release coat or film – Frekote 700NC or 770NC, FEP, TEDLAR
   Lay-up part using standard debulking procedures
3. Silicone edge dams for cure – slightly thicker than laminate
4. Laminate
5. Release coat or film – Frekote 700NC or 770NC, FEP, TEDLAR
6. Caul plate – aluminum, steel, Invar, silicone rubber sheet (metal caul plates must be release coated or wrapped)
7. 2.2 oz/yd^2 polyester breather, 1 or more
8. Vacuum bag
9. Vacuum sealant
10. Glass yarn string (alternatively or additionally breather may wrap over top of dam to contact edge)

Follow the provided Toray Advanced Composites cure cycle for the particular resin system.

Figure 1



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