

PRODUCT DATA SHEET



TENCATE ADVANCED COMPOSITES

EX-1522 Resin System

PRODUCT TYPE

350°F (177°C) Cure*
Toughened Epoxy Resin System

TYPICAL APPLICATIONS

- Aircraft Structures
- Space Structures
- Radomes and Antennas
- Reflectors
- Low Observables
- Radar Transparent Structures

SHELF LIFE

Tack Life

14 days tack life at 77°F (25°C)

Out Life

14 days out life 77°F (25°C)

Frozen Storage Life

6 months storage life at <0°F (-18°C)

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

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

* May be cured at
250°F/121°C or 300°F/150°C

PRODUCT DESCRIPTION

EX-1522 is a high performance toughened modified epoxy resin system. The material displays both excellent mechanical and thermal properties, in addition to very low moisture absorption. EX-1522 has a flammability rating of V-0, which lends itself to usage in low flammability applications. EX-1522's ideal electrical properties make it a lower cost option for radome, antennas and other critical electrical applications. Finally, EX-1522 is an outstanding resin selection for use where self-adhesion to honeycomb without the use of a film adhesive is desirable. This resin bonds to honeycomb under vacuum or pressure cure and displays cohesive honeycomb failure during destructive testing.

PRODUCT BENEFITS/FEATURES

- Robust processing under vacuum, autoclave or press
- Low dielectric and loss tangent for radome applications
- Low flammability, V-0
- Self adhesive to core
- Lower cost vs cyanate ester resins
- Low outgassing for space/satellite applications

TYPICAL NEAT RESIN PROPERTIES

Density1.36-1.46 g/cc
Moisture Absorption1.2% at saturation after 100 hr water boil
FlammabilityV-0

Dry Tg with 250°F/121°C cure259°F (126°C)
Wet Tg with 250°F/121°C cure253°F (123°C)

Dry Tg with 300°F/149°C cure336°F (169°C)
Wet Tg with 300°F/149°C cure318°F (159°C)

Dry Tg with 350°F/177°C cure356°F (180°C)
Wet Tg with 350°F/177°C cure331°F (166°C)

CTE49 ppm/°F (88 ppm/°C)

Outgassing (ASTM E595)TML0.28%
.....CVCM0.01%
.....WVR0.16%
.....TML-WVR0.12%

Dielectric Constant2.8 (at 10 GHz)
Loss Tangent0.008 (at 10 GHz)

JP4 Fuel ResistanceNo effect after 30 days at 77°F (25°C)
Tensile Strength9.6 ksi (66.2 MPa)
Tensile Modulus0.58 Msi (4 GPa)
Compression Strength21.4 ksi (147.5 MPa)
Compression Modulus0.53 Msi (3.7 GPa)
Poisson's Ratio0.48
Flexural Strength22.6 ksi (155.8 MPa)
Flexural Modulus0.52 Msi (3.6 GPa)
Flexural Strain5.5%
Thermal Conductivity0.170 W/m*K

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ELECTRICAL PROPERTIES OF COMPOSITE LAMINATES

EX-1522 / 4581 Quartz	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	3.35	3.31	3.31	3.31
Loss Tangent	<0.010*	<0.010*	<0.010*	<0.010*

EX-1522 / 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	4.72	4.67	4.66	4.64
Loss Tangent	0.012	0.013	0.010	0.011

* The loss tangent under focused beam testing is only accurate to 0.010. This material is less than 0.010. This material represents one of TenCate's best for high energy radome applications.

LAMINATE DATA - IM-7 GRAPHITE UNIDIRECTIONAL LAMINATE

Properties	Condition (RTD, ETD, ETW)	Method	Results	
Tensile Strength 0°	RTD	ASTM D3039	390 ksi	2689 MPa
Tensile Modulus 0°	RTD	ASTM D3039	25 Msi	172.4 GPa
Compressive Strength 0°	RTD	ASTM D695	80 ksi	552 MPa
In-Plane Shear Strength (G12)	RTD	ASTM D3518	12.6 ksi	86.9 MPa

- Standard cure 85 psi Autoclave - Normalized to 60% Fiber Volume

LAMINATE DATA - 4581 AQIII WOVEN FABRIC REINFORCEMENT. 288 gsm FAW.

Properties	Condition (RTD, ETD, ETW)	Method	Results	
Tensile Strength 90°	RTD	ASTM D3039	89 ksi	614 MPa
Tensile Modulus 90°	RTD	ASTM D3039	3.89 Msi	26.8 GPa
Tensile Strength 90°	ETW	ASTM D3039	63.7 ksi	439 MPa
Tensile Modulus 90°	ETW	ASTM D3039	3.79 Msi	26.1 GPa
Compressive Strength 0°	RTD	ASTM D695	82.9 ksi	572 MPa
Compressive Modulus 0°	RTD	ASTM D695	4.37 Msi	30.1 GPa
Compressive Strength 0°	ETW	ASTM D695	72.7 ksi	501 MPa
Compressive Modulus 0°	ETW	ASTM D695	4.17 Msi	28.8 GPa
Compressive Strength 90°	RTD	ASTM D695	90.1 ksi	621 MPa
Compressive Modulus 90°	RTD	ASTM D695	4.2 Msi	29.2 GPa
Compressive Strength 90°	ETW	ASTM D695	80.8 ksi	557 MPa
Compressive Modulus 90°	ETW	ASTM D695	4.0 Msi	27.8 GPa
Flexural Strength 0°	RTD	ASTM D7264	125 ksi	862 MPa
Flexural Modulus 0°	RTD	ASTM D7264	3.9 Msi	26.9 GPa
Short Beam Shear Strength	RTD	ASTM D 2344	11.1 ksi	76.5 MPa
Short Beam Shear Strength	ETW	ASTM D 2344	10.2 ksi	70.3 MPa

- ETW is 160°F (±5°F), (71°C ±3°C), 85% RH until saturated

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TYPICAL CURE PARAMETERS

- Apply full vacuum > 25 in. Hg, reduce vacuum to 9 in. Hg.
- Add autoclave pressure to 25 psi, heat 2°F/min (1°C/min) to 260°F (127°C), hold for 3 hours.
- Reduce pressure to 15 psi, then heat to 355°F (179°C) for 3 hours, cool 5°F/min (3°C/min) to 150°F (66°C) then release vacuum and pressure.

ALTERNATIVE CURE PARAMETERS

Alternate Cure 1 - 250°F/121°C cure*

- Apply full vacuum (>25 in. Hg) and perform leak check. Reduce vacuum to 9 in. Hg.
- Apply 25 psi of autoclave pressure, heat 2°F/min (1°C/min) to 250°F (121°C), hold for 4 hours.
- Cool at 5°F/min (3°C/min) to 150°F (65°C), then release vacuum and pressure.

Alternate Cure 2 - 300°F/150°C cure*

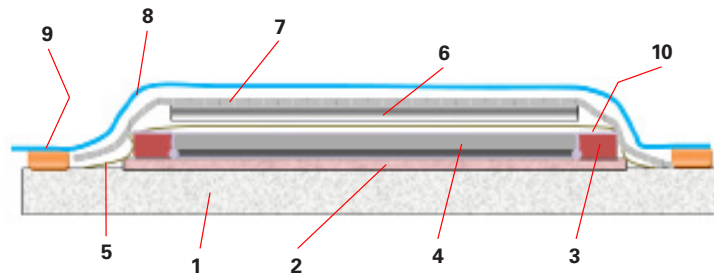
- Apply full vacuum (>25 in Hg) and perform leak check. Reduce vacuum to 9 in Hg.
- Apply 25 psi of autoclave pressure, heat 2°F/min (1°C/min) to 300°F (150°C), hold for 4 hours.
- Cool at 5°F/min (3°C/min) to 150°F (65°C), then release vacuum and pressure.

* Tg's differ under alternate cures. See page 1 for measured Tg's.

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
3. Silicone Edge Dams – 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 osy 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)



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All data given is based on representative samples of the materials in question. Since the method and circumstances under which these materials are processed and tested are key to their performance, and TenCate Advanced Composites has no assurance of how its customers will use the material, the corporation cannot guarantee these properties.

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