Toray MicroPly™ TC310

Toray Advanced Composites

PRODUCT DATA SHEET

DESCRIPTION

Toray MicroPly™ TC310 is a toughened epoxy film adhesive for composite bonding with excellent mechanical properties and toughness. It is ideal for honeycomb or laminate bonding, and may be cured under autoclave or vacuum bag processing.

FEATURES

- **Excellent balance of high temperature service and toughness**
- **Can be cured initially at 121°C (250°F), followed by a 177°C (350°F) post cure**
- **Designed for bonding honeycomb/composite structure or composite-to-composite laminate**
- **Can be co-cured with prepreg**

PRODUCT TYPE

Epoxy Film Adhesive

TYPICAL APPLICATIONS

Aircraft structural bonding for:

- Honeycomb core/skin bonding
- Precured composite laminate bonding
- Co-cured composite bonding

SHELF LIFE

Out Life:	30 days out life ≤ 21°C (70°F) and ≤ 60% RH
Frozen Storage Life:	12 months at ≤-18°C (≤ 0°F)

Out life is the maximum time allowed at 21°C (70°F) or below and 60% or less RH before cure, after a single frozen storage cycle in the original unopened packaging at -18°C (0°F) or below for a period not exceeding the frozen storage life noted above.

TYPICAL NEAT RESIN PROPERTIES

Dry T_g (DMA E′ Onset)	157°C (315°F)
Dielectric Constant	3.06 at 10 GHz
Loss Tangent	0.013 at 10 GHz
Outgassing (TML)	0.79%
Outgassing (CVMC)	< 0.01%
Outgassing (WVR)	0.35%

CURE SCHEDULE

2 hours at 121°C (250°F), followed by 1 hour at 177°C (350°F)
2 hours at 177°C (350°F) without dwelling at 121°C (250°F)

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COMMON FILM WEIGHTS/CONFIGURATIONS

Product Name	Carrier	Weight gsm (psf)	Roll Quality	Film Width
TC310 0.035 psf, NWFG, 0.91 m (36″)	Non-Woven Fg	171gsm (0.035 psf)	45.5 m^2 (500 ft^2)	0.91 m (36″)
TC310 0.060 psf, NWFG, 0.91 m (36″)	Non-Woven Fg	293gsm (0.060 psf)	45.5 m^2 (500 ft^2)	0.91 m (36″)

MECHANICAL PROPERTIES ON SUPPORTED ADHESIVE

Property	Condition	Methods	0.03 psf NWFg supported (150gsm)		0.05 NWFg supported (244gsm)	
Tensile Lap Shear	RTD	ASTM D 1002	31.1MPa	4510 psi	37.1 MPa	5383 psi
Tensile Lap Shear	ETD, 121°C (250°F)	ASTM D 1002	27.8 MPa	4035 psi	27.6 MPa	4002 psi
Tensile Lap Shear	ETD, 150°C (300°F)	ASTM D 1002	21.3 MPa	3090 psi	23.7 MPa	3440 psi
Flatwise Tensile[1]	RTD	ASTM C 297	3.3 MPa	485 psi	7.8 MPa	1134 psi
Flatwise Tensile[1]	ETD, 121°C (250°F)	ASTM C 297	2.8 MPa	410 psi	7.6 MPa	1108 psi
Flatwise Tensile[1]	ETD, 150°C (300°F)	ASTM C 297	2.3 MPa	335 psi	7.6 MPa	1103 psi

Property	Condition	Methods	0.015 psf unsupported (75gsm)		0.035 psf unsupported (175gsm)	
Tensile Lap Shear	RTD	ASTM D 1002	33.3 MPa	4825 psi	34.4 MPa	4985 psi
Tensile Lap Shear	ETD, 121°C (250°F)	ASTM D 1002	27.3 MPa	3965 psi	23.4 MPa	3400 psi
Tensile Lap Shear	ETD, 150°C (300°F)	ASTM D 1002	21.6 MPa	3130 psi	21.2 MPa	3080 psi
Flatwise Tensile[1]	RTD	ASTM C 297	-	-	5.2 MPa	755 psi
Flatwise Tensile[1]	ETD, 121°C (250°F)	ASTM C 297	-	-	5.2 MPa	750 psi
Flatwise Tensile[1]	ETD, 150°C (300°F)	ASTM C 297	-	-	3.6 MPa	520 psi

[1]Core 3/16 cell, 12 mm (0.5″) thick, 5052 Al, 4.4 pcf
Mechanical specimens cured for 2 hours at 177°C (350°F) at 1.3 bar (40 psi) autoclave pressure, ramp rate 1.1°C (2°F) per minute
Adherends for tensile lap shear testing: 2024-T_3 aluminum, 1.6 mm (0.063″), FPL etched and BR127 primed
Flatwise Tensile Facesheets: 2024-T_3 aluminum, 0.020″

ADHESIVE CURE: 0.060 PSF 106 F_g, 2 HOURS AT 177°C (350°F) UNDER 1 BAR 30 PSI AUTOCLAVE PRESSURE

Test	Condition	Method	Results	Results
Flatwise Tensile	CTD	ASTM C 297 25 mm x 25 mm (1"x1")	88 MPa	12726 psi
Flatwise Tensile	RTD	ASTM C 297 25 mm x 25 mm (1″x1″)	72 MPa	10406 psi
Flatwise Tensile	ETD1	ASTM C 297 25 mm x 25 mm (1″x1″)	61 MPa	8835 psi
Honeycomb[1] Flatwise Tensile	CTD	ASTM C 297 50 mm x 50 mm (2″x2″)	6 MPa	929 psi
Honeycomb[1] Flatwise Tensile	RTD	ASTM C 297 50 mm x 50 mm (2″x2″)	6 MPa	859 psi
Honeycomb[1] Flatwise Tensile	ETD1	ASTM C 297 50 mm x 50 mm (2″x2″)	5 MPa	753 psi
Lapshear Al-Al	CTD	ASTM D 1002	26 MPa	3758 psi
Lapshear Al-Al	RTD	ASTM D 1002	28 MPa	4108 psi

ADHESIVE CURE: 0.060 PSF 106 F_g, 2 HOURS AT 177°C (350°F) UNDER 1 BAR 30 PSI AUTOCLAVE PRESSURE

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Test	Condition	Method	Results	Results
Lapshear Al-Al	ETD1	ASTM D 1002	22 MPa	3230 psi
Lapshear Al-Al	ETW	ASTM D 1002	21 MPa	3054 psi
Thick-Adherend Lap Shear Strength[2]	CTD	ASTM D 5656	65 MPa	9506 psi
Thick-Adherend Lap Shear Strength	RTD	ASTM D 5656	62 MPa	8951 psi
Thick-Adherend Lap Shear Strength	ETD	ASTM D 5656	45 MPa	6585 psi
Thick-Adherend Lap Shear Strength	ETD1	ASTM D 5656	38 MPa	5495 psi
Thick-Adherend Lap ShearStrength	ETW	ASTM D 5656	40 MPa	5776 psi
Thick-Adherend Lap Shear Strength	ETW1	ASTM D 5656	27 MPa	3972 psi
Thick-Adherend Lap Shear Modulus[2]	CTD	ASTM D 5656	0.4 GPa	0.062 Msi
Thick-Adherend Lap Shear Modulus	RTD	ASTM D 5656	0.4 GPa	0.060 Msi
Thick-Adherend Lap Shear Modulus	ETD	ASTM D 5656	0.2 GPa	0.035 Msi
Thick-Adherend Lap Shear Modulus	ETD	ASTM D 5656	0.3 GPa	0.043 Msi
Thick-Adherend Lap Shear Modulus	ETW[4]	ASTM D 5656	0.4 GPa	0.052 Msi
Thick-Adherend Lap Shear Modulus	ETW1[4]	ASTM D 5656	0.1 GPa	0.017 Msi
T-peel	CTD	ASTM D 1876	26 N/25 mm	6 lb/in
T-peel	RTD	ASTM D 1876	39 N/25 mm	9 lb/in
T-peel	ETD1[4]	ASTM D 1876	23 N/25 mm	5 lb/in
G_1c DCB3	RTD	D6-83079-131	261 J/m²	1.49 in-lb/in²
G_2c ENF (Natural Crack)[3]	RTD	D6-83079-132	1496 J/m²	8.55 in-lb/in²
Lapshear GrEp-GrEp[3]	CTD	ASTM D 1002	13.6 MPa	1977 psi
Lapshear GrEp-GrEp[3]	RTD	ASTM D 1002	12.8 MPa	1855 psi
Lapshear GrEp-GrEp[3]	ETD1	ASTM D 1002	11.2 MPa	1628 psi
Lapshear GrEp-GrEp[3]	ETW1	ASTM D 1002	5.9 MPa	860 psi

Notes: All aluminum surfaces have been FPL etched and BR127 bond primed

[1]Plascore aluminum core XR1-7.9-0.250-N-5052 12.7 mm (0.5") thickness for honeycomb flatwise tensile testing

[2]Bonded and tested at National Institute for Aviation Research (NIAR) Wichita, KS, for thick adherend testing

[3]Bonded to grit blasted standard-modulus graphite fabric with 121°–135°C (250°–275°F) final cure epoxy (HX-42)

[4]CTD is 18°C (65°F), ETD is tested at 82°C (180°F), ETD1 is tested at 121°C (250°F), ETW is tested at 82°C (180°F), and ETW1 is tested at 121°C (250°F) after 14 days 85% RH and 71°C (160°F) humidity exposure

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