Technical Data Sheet

Evopreg® ampliTex™ EPT120 Hybrid Tooling

Low temperature cure hybrid carbon/flax epoxy prepregs for tooling with reduced cost and environmental impact

Introduction

Evopreg® EPT120 tooling prepregs are based on a low temperature curing, toughened epoxy resin system, formulated specifically for high temperature performance, ease of lay-up and excellent surface finish.

Evopreg® ampliTex™ flax-epoxy prepregs can be combined with carbon fibre-epoxy prepregs to produce a lower cost, lighter and more sustainable tooling system whilst maintaining the dimensional stability you would expect from an all-carbon tool.

This system allows an all-carbon 1/8/1 tooling layup (C205T/C650T/C205T) to be replaced with, for example, a hybrid 1/1/5/1/1 layup (C205T/C650T/F500T/C650T/C205T) or, for less demanding tooling, a hybrid 1/7/1 carbon/flax hybrid layup (C205T/F500T/C205T).

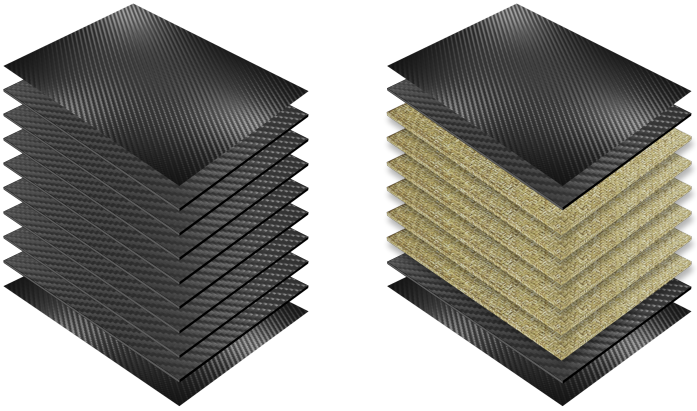

Diagram of all-carbon 1/8/1 tooling lay-up vs carbon/flax hybrid 1/1/5/1/1 lay-up

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Certificate Number 442031

Key Features & Benefits

- Initial cure temperature 65°C
- Service temperature up to 150°C after post-cure
- Suitable for autoclave processes
- 10 days out-life at 20°C
- 12 months storage life at -18°C
- Toughened
- Excellent surface finish
- Excellent release from patterns
- High dimensional stability (due to the very closely matched thermal expansion coefficients of flax and carbon)
- Reduced material cost and lay-up time
- Reduced tool weight
- More sustainable than a full carbon tool

Processing & Curing

It is recommended to perform an initial cure at low temperature in an autoclave at 6 bar followed by a free-standing post-cure to achieve best performance. Suggested cure cycles are shown below.

Flax bulking plies do not exhibit the same level of tack and drape as carbon bulking plies but should be adequate for most applications. Well-placed cuts may be required where drape is a problem and vacuum debulking steps are recommended to consolidate plies and hold in place.

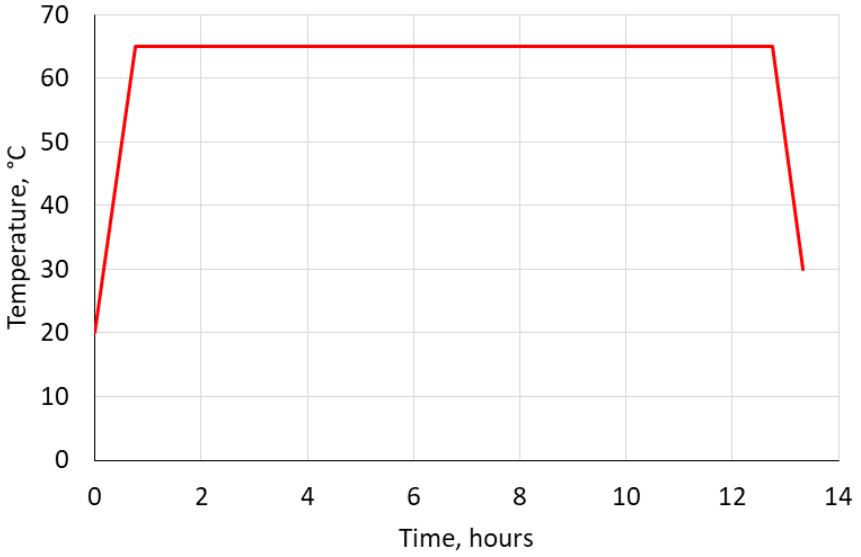
Initial Cure

The times indicated in the table below are minimum cure times. If in doubt regarding the accuracy of the temperature controller or process it is recommended to add extra time.

		Glass transition temperature, Tg	
Initial cure temperature	**Minimum cure time**	**Tg, onset E'**	**Tg, peak tan δ**
65°C (recommended)	12 hours	79°C	101°C

- Recommended ramp rate for initial cure 0.5°C/min.
- Care should be taken to heat and cool slowly and steadily to avoid exothermic reactions, ensure even heating and prevent distortion and cracking of patterns.
- Cure times may need to be extended to account for thermal lag in large tools.
- Allow the pattern to cool to below 30°C before demoulding.

Suggested initial cure cycle (ramp rate 0.5°C/min, dwell 12 hours at 65°C):

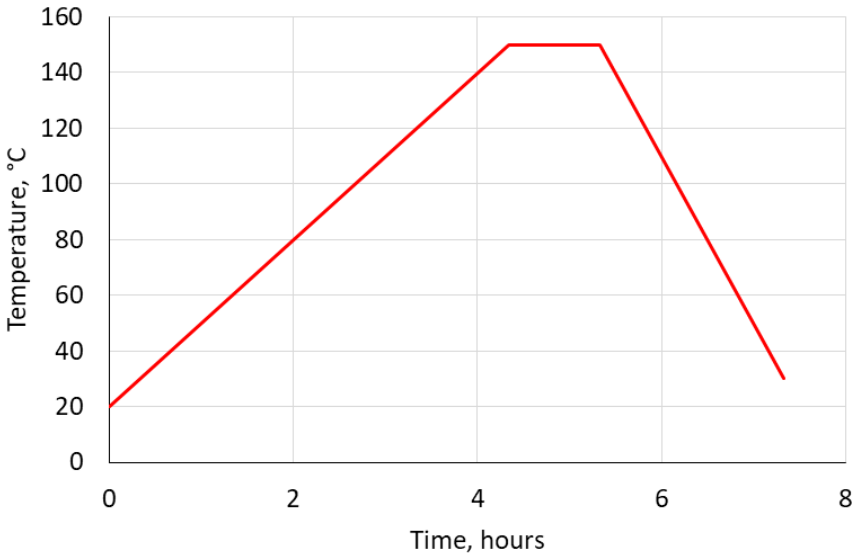


Post-Cure

		Glass transition temperature, Tg	
Post-cure temperature	**Cure time**	**Tg, onset E'**	**Tg, peak tan δ**
150°C	1 hour	150°C	165°C

- Recommended ramp rate for post-cure 0.5°C/min
- Care should be taken to heat slowly and steadily to avoid distortion during post-cure, larger moulds may require additional support.

Suggested post-cure schedule (ramp rate 0.5°C/min, dwell 1 hour at 150 °C):



Composite Properties

Typical data for laminates made from Evopreg® EPT120

Layup 1/1/4/1/1	Layup 1/6/1
• 1-ply C205T • 1-ply C650T • 4-ply F500T • 1-ply C650T • 1-ply C205T	• 1-ply C205T • 6-ply F500T • 1-ply C205T

Cured in oven for 12 hours at 65°C and full vacuum bag pressure and then given a free-standing post-cure for 1 hour at 150°C.

Property	Result 1/1/4/1/1	Result 1/6/1	Test method
Flexural strength, 0°	401 MPa	250 MPa	ISO 14125 (class III)
Flexural modulus, 0°	39.6 GPa	23.0 GPa	ISO 14125 (class III)

Available Products

Evopreg® EPT120 prepregs are available with a wide range of reinforcements, including woven, non-crimp stitched and unidirectional fabrics. Standard products for the carbon/flax hybrid system are as follows:

- Carbon 205 g/m² 2x2 twill 3K surface ply
- Carbon 650 g/m² 2x2 twill 12K bulk ply
- ampliTex™ flax 500 g/m² 4x4 twill bulking plies

For other reinforcements, including glass, please contact us.

Packaging

The material is typically delivered in rolls and with a silicone coated release paper on the bottom and a polythene release film on the top. Typical packaging - 76mm (3") diameter cardboard core, polythene bag, reusable cable ties, cardboard box and end supports. Where relevant, multiple boxes are typically stacked on a standard wooden pallet, strapped and covered with stretch wrap. Other packaging may be available on request. We recommend retaining the boxed packaging to protect the material during storage.

Storage

The material must be stored in a freezer at -18°C and sealed in a polythene bag. To protect the material, we recommend storing it in its original box with the end supports. To avoid moisture condensation, allow the material to defrost fully and reach room temperature before opening the polythene bag. Typical thaw time for full roll is 4-6 hours. Keep the material sealed in the polythene bag when not in use to prevent moisture absorption. The cable tie that seals the polythene bag is reusable. Out-life at room temperature is 10 days. Storage life at -18°C is 12 months.

Health & Safety

Please refer to the Safety Data Sheet (SDS) before use. This material contains epoxy resin and fibres which can cause irritation to skin and eyes and allergic reactions. Wear appropriate PPE including overalls and impervious gloves, and ensure adequate ventilation.

Evopreg® EPT120 prepregs contain a highly reactive epoxy resin formulation which can undergo severe exothermic reactions. Particular care must be taken when curing thick laminates. Do not exceed recommended ramp rates.

Disclaimer

The information provided here is believed to be accurate but should be considered indicative only. It is the responsibility of the customer to check the suitability of the product for their specific application prior to use.

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