ELANTAS Solutions for Bio-based composites

ELANTAS Europe – Distributor meeting

Collecchio – 28th May 2025

Federico Bertani – EM R&D Manager

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Agenda

- Sustainability @ ELANTAS
- Bio-based materials
- ELANTAS Solutions
- Future developments

Sustainability
Strategy @ ELANTAS Europe

Bio-based Materials	Labelling	Process	Circular economy
			
• Introduce and extend the use of bio-based raw materials	• Reduce overall impact of chemicals labelling	• Promote the implementation of processes with lower energy consumption inhouse and at customer site	• Promote the concept of circular economy • Long term research in the area of recycling

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Strategy @ ELANTAS Europe

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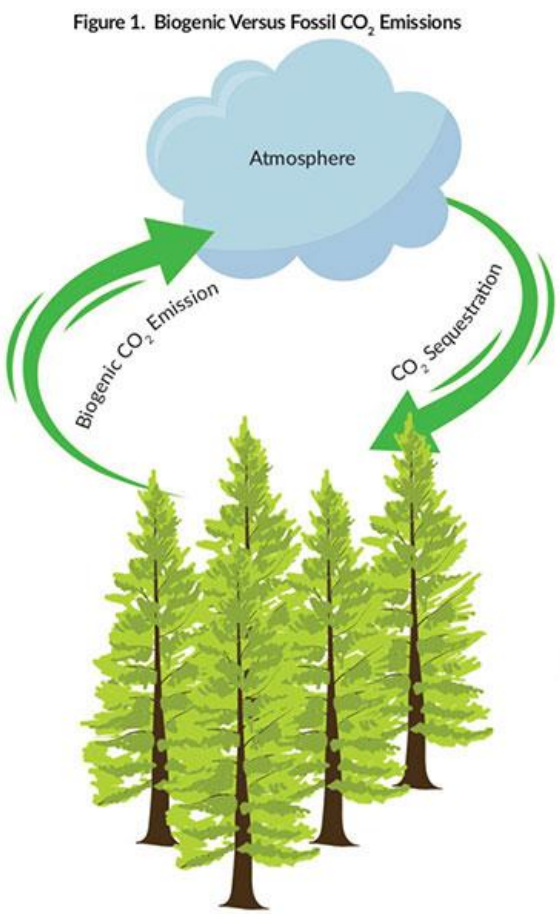
Bio-based materials
Definitions

Bio-based materials:

Organic material containing in whole or part carbon from **biological sources**

Carbon is present in the atmosphere as CO_2



This is a

sustainable process!

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Bio-based materials
How to trace carbon from biological sources

Bio (carbon) content:

- The bio (carbon) content is based on the amount of biogenic carbon

$$\textit{Bio or Biobased (carbon) content (\%)} = \frac{Bio\ (organic) carbon}{Total\ (organic) carbon} * 100$$

ASTM D 6866

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Bio-based materials
ELANTAS Product porfolio

Continuos scouting and testing of innovative raw materials prompted the creation of a bio-based product portfolio over the last years.

ELANTAS bio-based products retain the full performances of fossil-based materials while advancing sustainability.

Elan-tech® bio-based products developed to meet markets demand:

Area	Process application	Status	Elan-tech® resin	Elan-tech® hardener	Bio-based content
Composite	Infusion	On the market	EC 157.1 BIO	W 154 BIO series	38 – 46
Composite	Lamination	On the market	EC 152 BIO	W 154 BIO series	28 - 34
Composite	RTM	On the market	EC 157.1 BIO	W 154 HR BIO	37 - 43
Adhesive	Structural	On the market	AS 74 BIO	AW 74 BIO	57 - 63
Adhesive	Multipurpose	Just developed	AS 64 BIO	AW 64 BIO	37 - 43
Composite	Pre-preg	On the market	ECM 182 BIO	W 752	7 - 13

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Bio-based epoxy systems for composites

Infusion

Properties	Conditions	Test Method	EC 157.1 / W 152 MR	EC 157.1 BIO / W 154 BIO
Mix ratio by weight	--	--	100:30	**100:30**
Initial mixture viscosity [mPa· s]	25 °C	IO-10-50 (ISO 3219)	225 – 335	**450 - 650**
Pot life [min]	25 °C 50 mm - 200 ml	IO-10-53	45 – 55	**50 - 60**
Gel time [h]	25 °C, 1 mm	IO-10-88 (ASTM D 5895-03)	7,5 – 8,5	**7 - 9**
Hardness [Shore D/15]	24 h RT + 15 h 60 °C	IO-10-58 (ASTM D 2240)	85 - 89	**81 - 85**
Tg [°C]	24 h RT + 15 h 60 °C	IO-10-69 (ASTM D 3418)	76 - 82	**77 - 83**
^{14}C content of the system [%]	--	ASTM D 6866-22	na	**40 - 45**
Bio-based resin	--	--	X	✓
Bio-based hardener	--	--	X	✓

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Bio-based epoxy systems for composites
Infusion

Properties	Conditions	Test Method	EC 157.1 BIO / W 152 LR	EC 157.1 BIO / W 154 LR-HT BIO	EC 157.1 BIO / W 154 XXLR BIO
Mix ratio by weight	--	--	100:30	100:30	100:30
Initial mixture viscosity [mPa· s]	25 °C	IO-10-50 (ISO 3219)	350 - 550	400 - 600	250 - 350
Pot life [min]	25 °C 50 mm - 200 ml	IO-10-53	145 - 215	55 - 70	110 - 140
Gel time [h]	25 °C, 1 mm	IO-10-88 (ASTM D 5895-03)	15 - 17	8 - 10	15 - 17
Hardness [Shore D/15]	24 h RT + 15 h 60 °C	IO-10-58 (ASTM D 2240)	81 - 85	79 - 83	na
Tg [°C]	24 h RT + 15 h 60 °C	IO-10-69 (ASTM D 3418)	73 - 78	80 - 86	64 - 70
^{14}C content of the system [%]	--	ASTM D 6866-22	25 - 30	37 - 43	32 - 37
Bio-based resin	--	--	✓	✓	✓
Bio-based hardener	--	--	X	✓	✓

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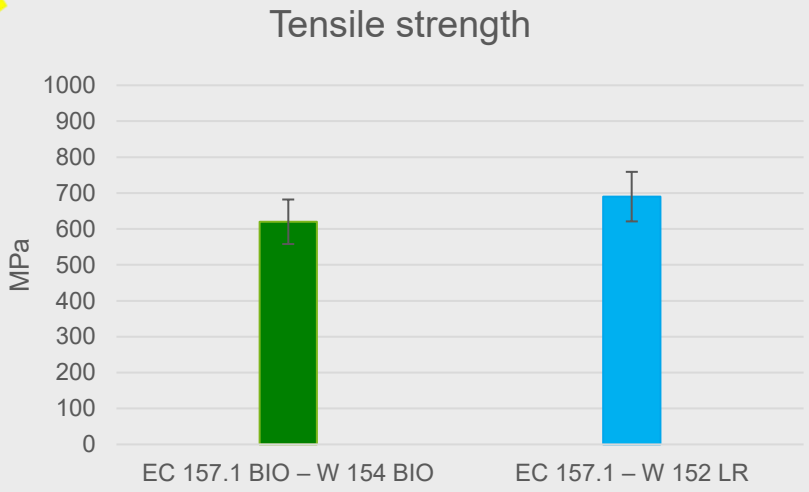
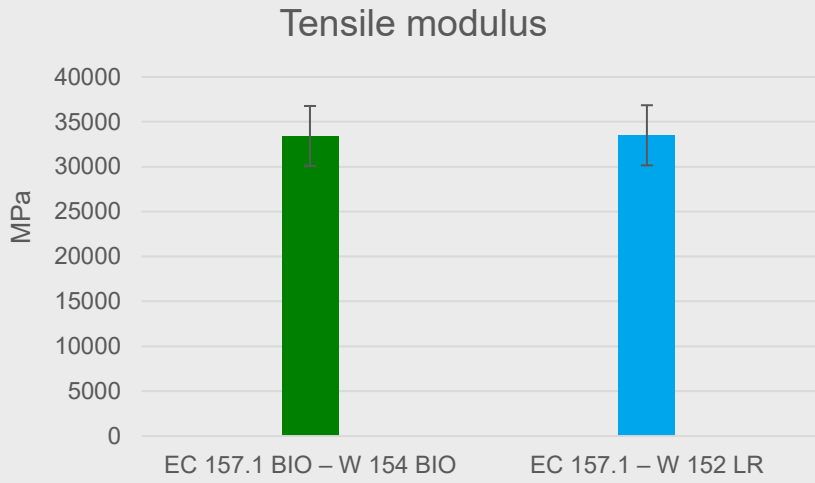
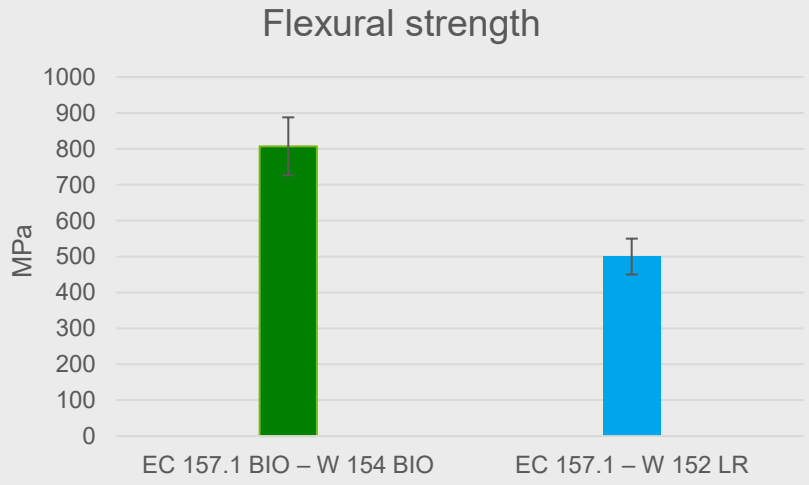
Bio-based epoxy systems for composites
Infusion: mechanical properties

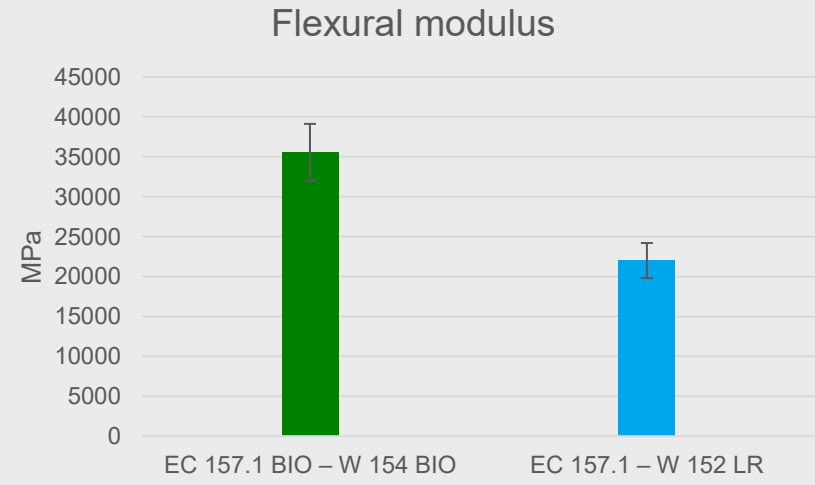
Bio-content: 13 - 15%

Texture:
Glass fibre
UD E640









Mechanical properties of the bio-based systems are retained.

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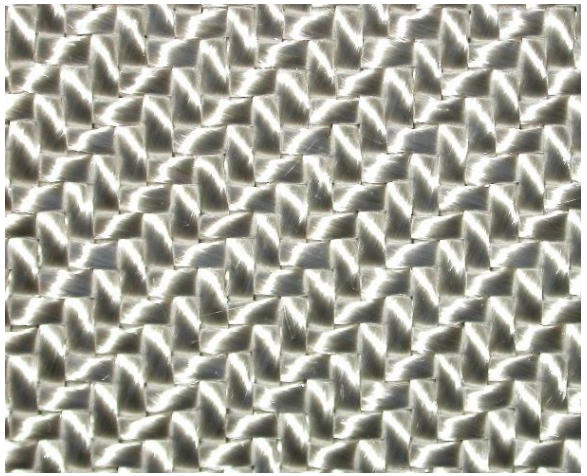
Bio-based epoxy systems for composites
Infusion: natural fibres

We produced bio-composite panels using Elan-tech® EC 157.1 BIO – W 154 BIO as matrix.

As reinforcement, three different type of natural fibres were tested.

Natural fibres from BÜFA:

- Cellulose: twill 2x2, 509 g/m^2
- Flax: twill 2x2, 400 g/m^2



Natural fibres from BComp:

- Flax: Twill, 280 g/m^2

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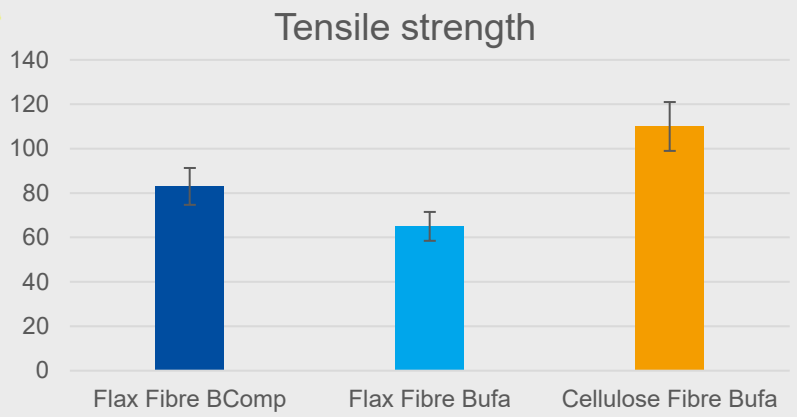
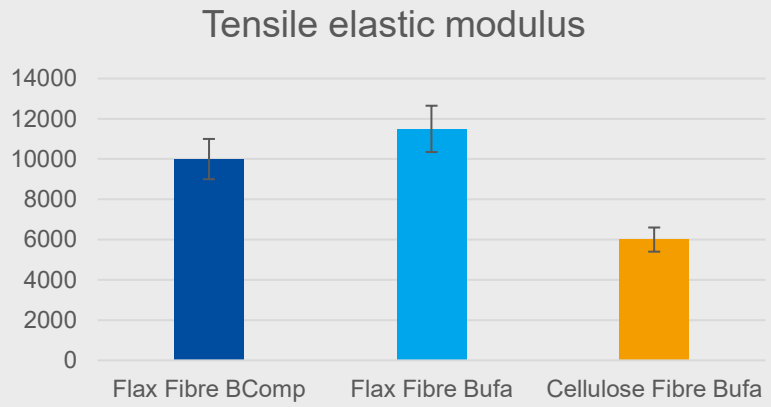
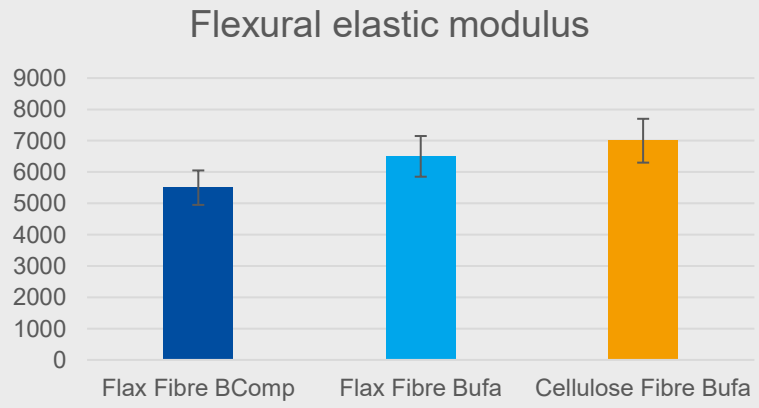
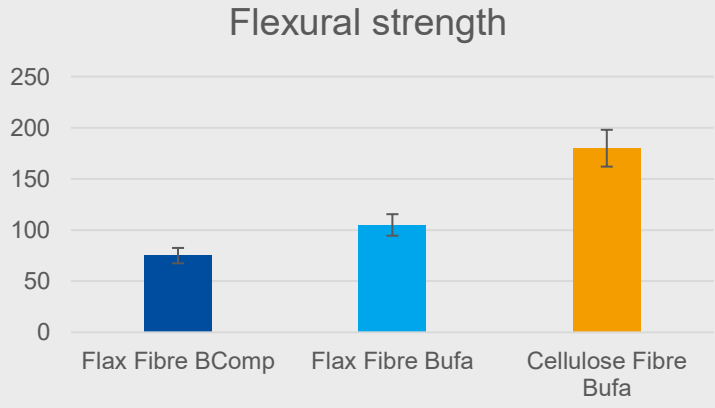
Bio-based epoxy systems for composites
Infusion: natural fibres

Bio-content: Up to 80%









Cellulose is the most promising reinforcement fibre.

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Composite	Pre-preg	On the market	ECM 182 BIO	W 752.1	7 - 13

Bio-based epoxy systems for composites
Wet hand lay-up

Properties	Conditions	Test Method	EC 152 / W 152 XLR-HT	EC 152 BIO / W 152 XLR-HT	EC 152 / W 152 MR	EC 152 BIO / W 154 BIO
Mix ratio by weight	--	--	100:30	**100:30**	100:30	**100:30**
Initial mixture viscosity [mPa· s]	25 °C	IO-10-50 (ISO 3219)	400 – 500	**400 - 600**	600 – 900	**700 - 900**
Pot life [min]	25 °C 50 mm - 200 ml	IO-10-53	na	**na**	43 – 53	**58 - 68**
	25 °C 80 mm – 500 ml		130 - 155	**135 – 145**	na	**na**
Gel time [h]	25 °C, 1 mm	IO-10-88 (ASTM D 5895-03)	10,5 – 11,5	**11,5 – 12,5**	7,5 - 8,5	**6 - 7**
Hardness [Shore D/15]	24 h RT + 15 h 60 °C	IO-10-58 (ASTM D 2240)	82 - 86	**82 - 86**	85 – 89	**82 - 86**
Tg [°C]	24 h RT + 15 h 60 °C	IO-10-69 (ASTM D 3418)	83 - 88	**85 - 91**	85 - 91	**86 - 92**
^{14}C content of the system [%]	--	ASTM D 6866-22	-	**≈20**	-	**28 - 34**
Bio-based resin	--	--	X	✓	X	✓
Bio-based hardener	--	--	X	X	X	✓

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Bio-based epoxy systems for composites
RTM process

Properties	Conditions	Test Method	EC 157.1 / W 152.1 HR	EC 157.1 BIO / W 154 HR BIO
Mix ratio by weight	--	--	100:30	**100:30**
Initial mixture viscosity [mPa· s]	25 °C	IO-10-50 (ISO 3219)	200 - 400	**400 - 600**
Pot life [min]	25 °C 40 mm – 100 ml	IO-10-53	na	**38 – 47**
	25 °C 50 mm - 200 ml		10 -14	**na**
Gel time [h]	25 °C, 1 mm	IO-10-88 (ASTM D 5895-03)	3 - 4	**5 - 7**
Tg [°C]	24 h RT + 15 h 60 °C	IO-10-69 (ASTM D 3418)	82 – 88[1]	**80 - 85**
^{14}C content of the system [%]	--	ASTM D 6866-22	--	**37 - 43**
Bio-based resin	--	--	X	✓
Bio-based hardener	--	--	X	✓

[1] 24 h RT + 15 h 80°C

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Strcutural bio-based adhesive
Elan-tech® ADH 74.74 BIO

Performances aligned to our top seller ADH 891.892.

Typical properties	Test Method	ADH 891.892	ADH 74.74 BIO
Mix ratio by volume	--	100:50	**100:50**
Gel time, 1 mm, 25 °C [h]	IO-10-88 (ASTM D 5895-03)	3,5 – 4,5	**4,5 – 5,5**
Pot life, 40 mm, 100 ml [min]	IO-10-53	15 - 25	**33 - 43**
Tg (24 h RT) [°C]	IO-10-69 (ASTM D 3418)	52 - 58	**45 - 50**
Tg max (8h 80 °C) [°C]	IO-10-69 (ASTM D 3418)	82 - 88	**91 - 97**
^{14}C content of the system [%]	ASTM D 6866-22	0	**Up to 60**

- ✓ Bio-based resin and hardener
- ✓ Perfect rheology behaviour
- ✓ Good wettability
- ✓ Black coloured for carbon look applications
- ✓ High thermal resistance
- ✓ Structural mechanical properties
- ✓ High ^{14}C content
- ✓ CMR Free

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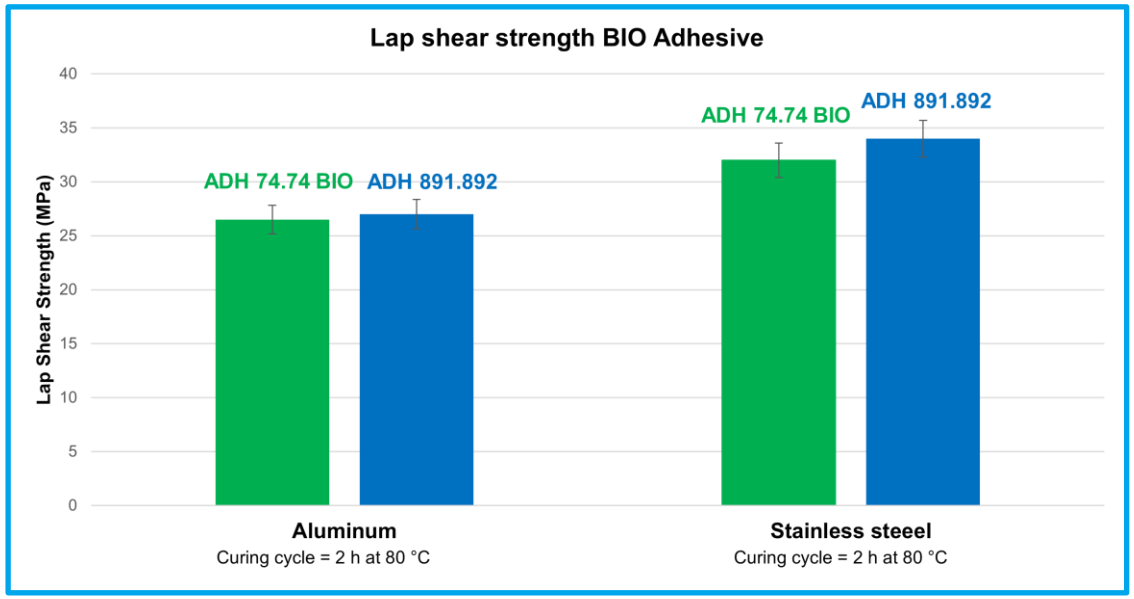
Strcutural bio-based adhesive
Elan-tech® ADH 74.74 BIO



Excellent LSS performances on both Aluminum and Stainless steel.

Available in cartridges made from up to 100% recycled material.

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Composite	**Pre-preg**	**On the market**	**ECM 182 BIO**	**W 752**	**7 - 13**

Pre-preg system
Elan-tech® ECM 182 BIO

Our bio-based hot-melt system for pre-preg manufacturing.

Key benefits

- 1K or 2K to adjust the reactivity and product shelf-life.
- Solvent-free.
- Colorless.
- Excellent stability.
- Succesfully tested with carbon, flax, glass fibres.
- Fast curing at temperature below 150 °C.
- Tg above 100 °C.

Applications: automotive, marine, hydrogen storage, aerospace, sports and leisure.

Exemplary automotive component

Presented at JEC World 2024

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Pre-preg system
Elan-tech® ECM 182 BIO

Properties	Test Method	ECM 182 BIO / W 752
Mix ratio by weight	--	100:5
Minimum mixture viscosity [mPa· s]	IO-10-95 (ISO 3219)	200 – 300
Temperature at minimum viscosity [°C]	IO-10-95 (ISO 3219)	117 °C
Tg [°C] see suggested cycle	IO-10-69 (ASTM D 3418)	108 - 114
Enthalpy ΔH [J/g]	IO-10-69 (ASTM D 3418)	360 - 380

Suggested curing cycle:

1. Apply full vacuum (1 bar)
2. Apply 6 bar gauge autoclave pressure or 2 bar for sandwich panels
3. Reduce the vacuum when the autoclave pressure reaches approximately 1 bar gauge
4. Heat at 2÷3 °C/min to 110°C
5. Hold at 110°C for 20 min
6. Heat at 2÷3 °C/min to 135°C
7. Hold at 135°C for 60 min
8. Cool at 2÷3 °C/min to 60°C
9. Cool at 3÷5 °C/min

Easy to process with impregnation machines thanks to its viscosity and stability up to 70 °C.

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Future developments
Your opinion matters!

Concept in development: flame-retardant epoxy resin for Prepreg.

Context: growing demand for flame-retardant composite materials in sectors such as aerospace, rail and construction.

Technical features:

- flame-retardant properties.
- low smoke and toxicity emissions.
- compatibility with carbon and glass fibers.
- processability and properties similar to our current prepreg systems.

Call to Action:

- Would you be interested in testing a prototype?
- What characteristics are most important to you?

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Thank you for your attention