

A material selection journey for sustainable discontinuous fibre composites

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Motivation and Aim



2

- Investigating the **viability** of using **sustainable** constituents within the **HiPerDiF** method for **circular economy**

Fibre



Carbon fibres



Glass fibres

Polymer (Matrix)



Epoxy resin

~~X~~ renewable

~~X~~ easy to recycle

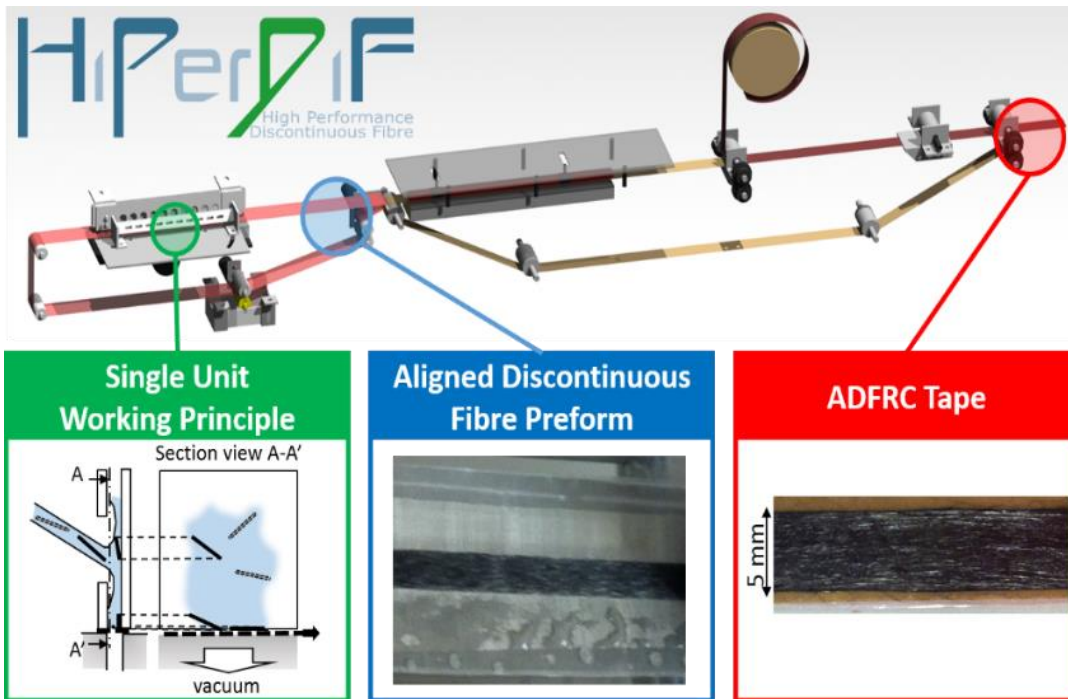
~~X~~ low environmental impact

~~X~~ biodegradable

~~X~~ sustainable

- Selection of sustainable **reinforcement materials** that is compatible for the HiPerDiF method

- Selection of sustainable **matrix material**



HiPerDiF is a **water-based** process has a potential to produce high performance structures by using **eco-friendly, low impact, green, and renewables** constituents. The main **alignment** mechanism is a **sudden momentum change of fibre-water suspension**.

Article

Characterisation of Natural Fibres for Sustainable Discontinuous Fibre Composite Materials

Ali Kandemir ^{*}, Thomas R. Pozegic, Ian Hamerton , Stephen J. Eichhorn and Marco L. Longana



Flax



Curaua

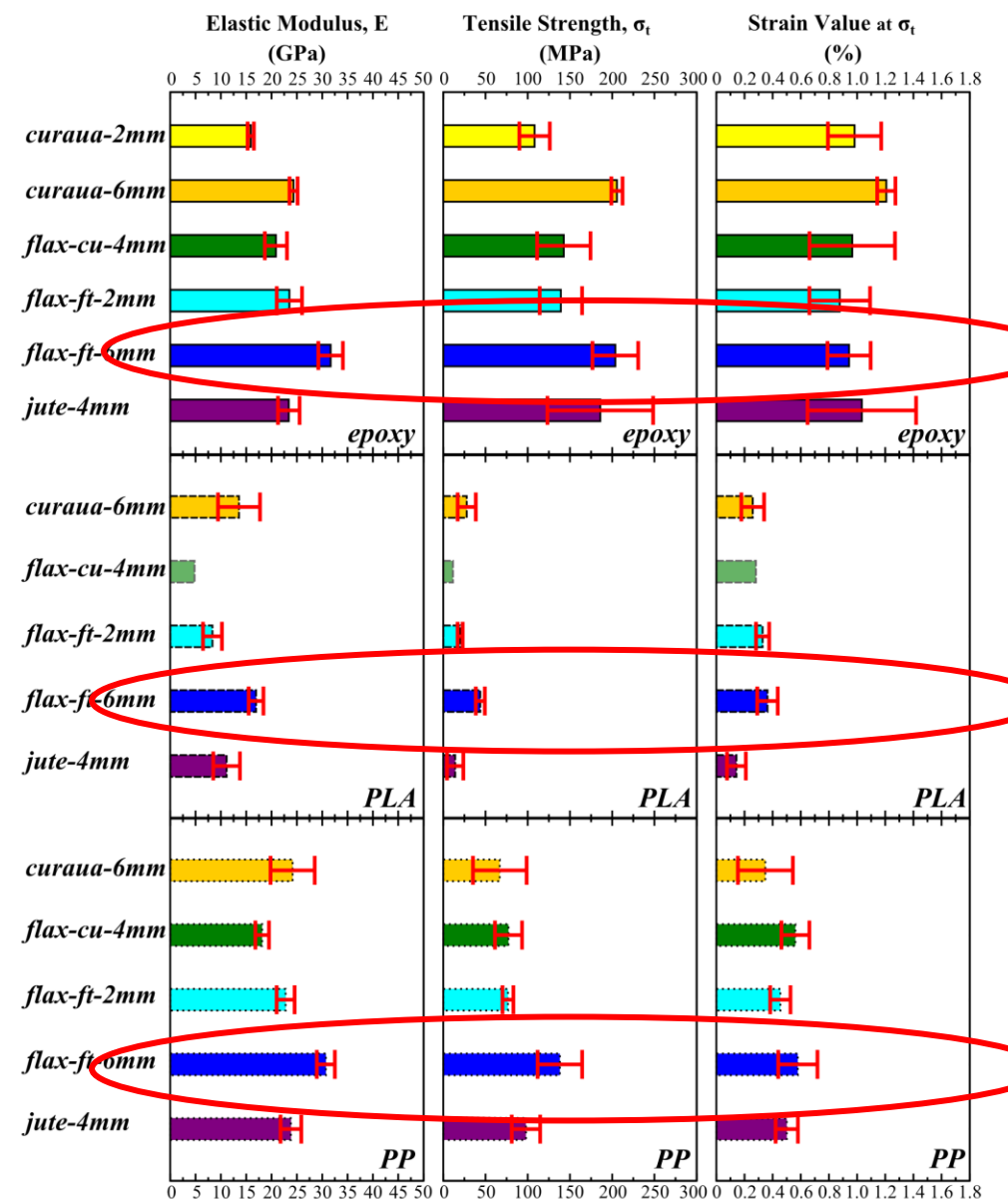
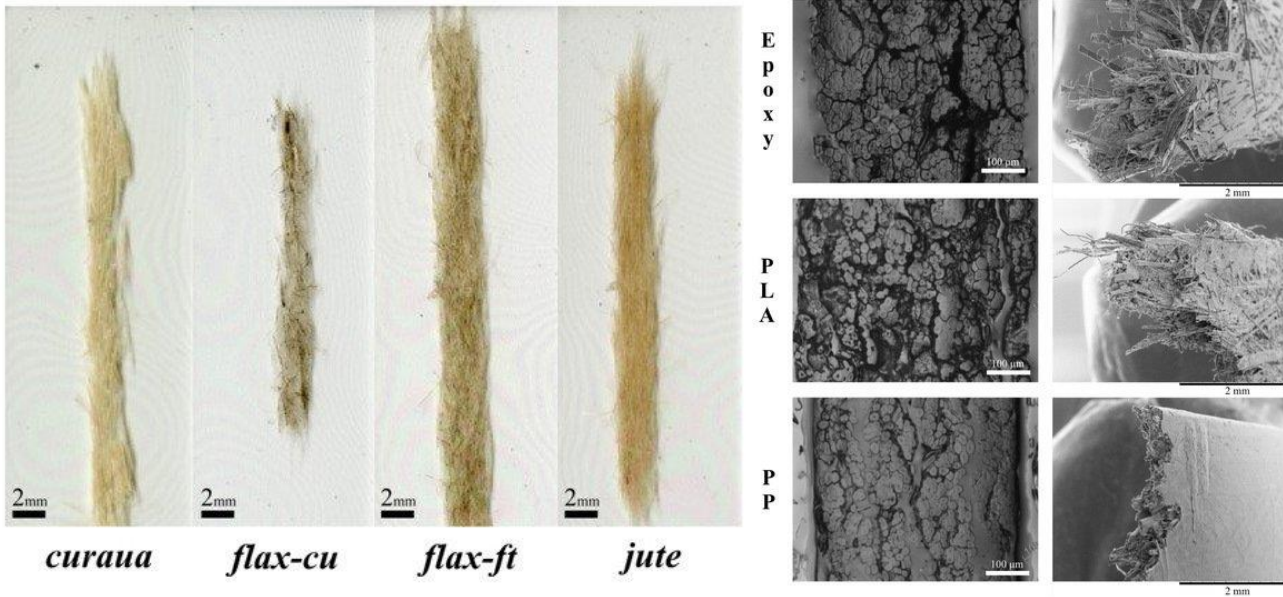


Jute

Article

Natural Fibres as a Sustainable Reinforcement Constituent in Aligned Discontinuous Polymer Composites Produced by the HiPerDiF Method

Ali Kandemir ^{1,*}, Marco L. Longana ¹, Tulio H. Panzera ², Gilberto G. del Pino ³, Ian Hamerton ¹ and Stephen J. Eichhorn ¹





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Fibre



Polymer (Matrix)



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✓ sustainable

✓ Selection of sustainable **reinforcement materials** that is compatible for the HiPerDiF method

○ Selection of sustainable **matrix materials**

Developing aligned discontinuous flax fibre composites: Sustainable matrix selection and repair performance of vitrimers

Ali Kandemir  , Marco L. Longana, Ian Hamerton, Stephen J. Eichhorn

1

Elium® resin
from Arkema

Advanced thermoplastic resin show mechanical properties similar to epoxy composites.

- High impact resistance
- Post-thermoformability
- Recyclability
- Material assembling possibilities

2

Furacure (PFA)
from Bitrez LTD.

A poly-furfural alcohol “PFA” bio-based polymers derived from biomass.

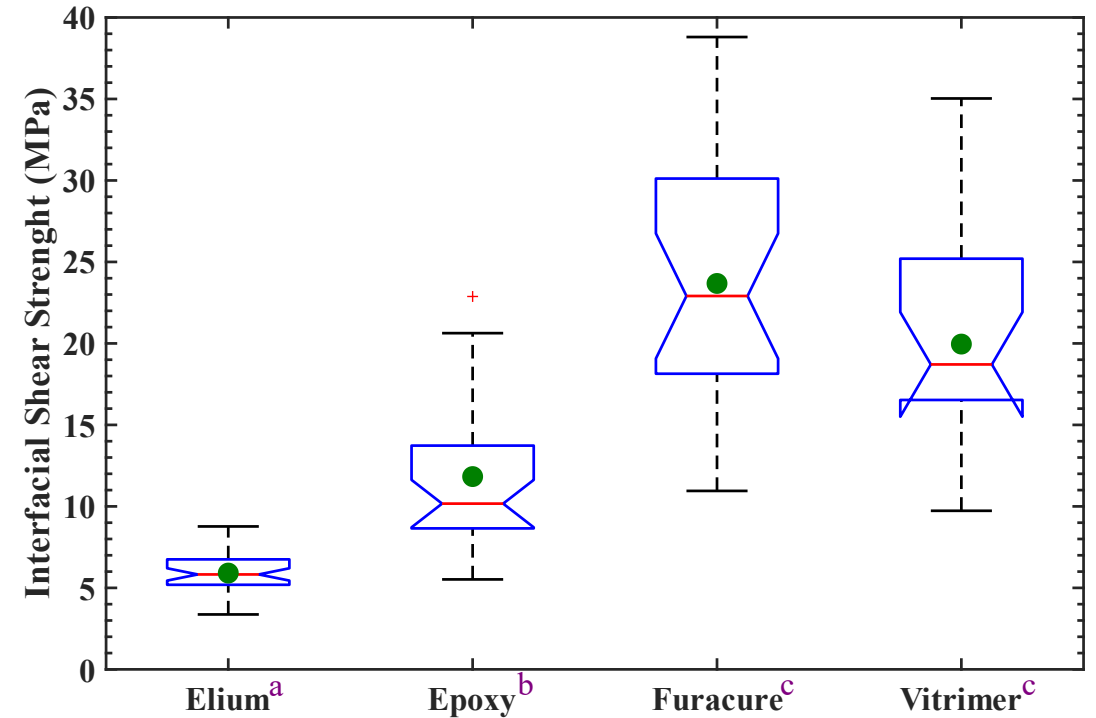
- REACH compliant polymer
- Bio-based grade
- High thermal performance
- Fire resistant

3

Vitrimax (Vitrimer)
from Mallinda Inc.

A new platform chemistry based on dynamically exchangeable imine-linked polymer networks.

- Remoldability, reshaping
- High mechanical performance
- Covalent welding
- Recyclability
- Reusability



Fibre



Polymer (Matrix)



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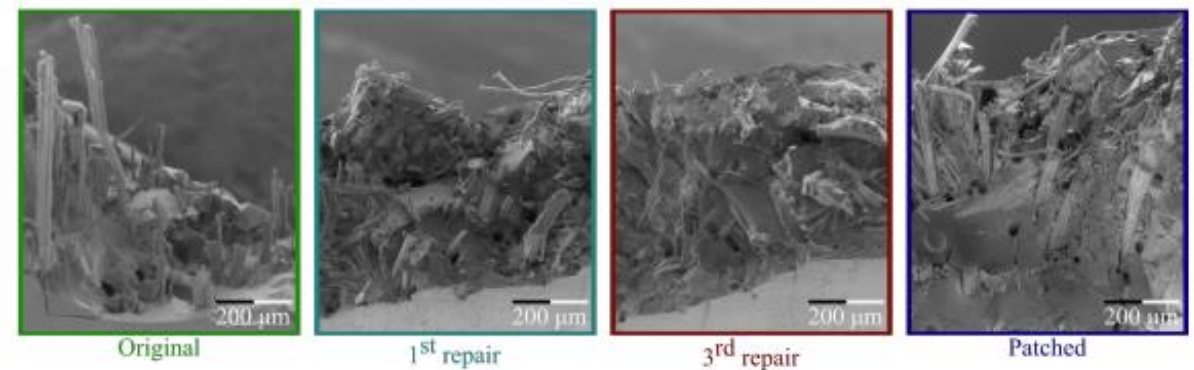
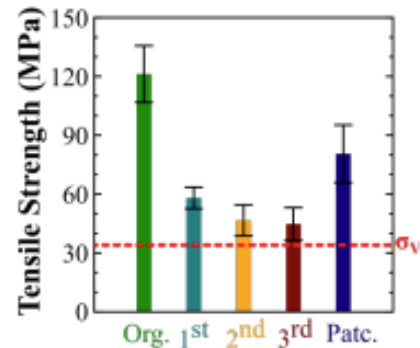
✓ easy to recycle

✓ Circular economy

✓ Selection of sustainable **reinforcement materials** that is compatible for the HiPerDiF method

✓ Selection of sustainable **matrix material**

Future work





Bristol Composites Institute

Thank You for Your Attention



**KEEP CALM
WASH YOUR HANDS
AND
STAY ALERT**

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EPSRC Centre for Doctoral Training
in Advanced Composites
for Innovation and Science



Engineering and
Physical Sciences
Research Council

