

Closed-loop recycling of fibre-reinforced plastic composites

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Energy and clean technology



> TRL 4-6

Problem

The ultra-high strength in lightweight carbon fibre reinforced composites (CFRP) originates from the alignment of the individual carbon fibrils. Upon recycling of the composite from its high-performance applications, these individual carbon fibrils become misaligned and are not easily realigned. The lack of methods to effectively realign waste and recycled carbon fibre filaments severely limits the feasibility and circularity of fibre-reinforced plastic recycling.

Solution

A hydromagnetic fibre alignment machine (HMFAM) has been developed that realigns carbon fibre and enables the remanufacturing of recycled composites. Using this device, the fibre length, fibre content, geometry and surface characteristics can be controlled during the realignment process of recycled fibres, with comparatively high fibre volume fractions up to 60%.

Remanufactured CFRP composites using the recycled carbon fibres have shown mechanical properties of up to 50% of a composite with pristine fibres, which is as strong as steel.

Intellectual Property Status

PCT application No. PCT/AU2021/050286.
National Phase Entry in AU, EP, KR, NZ, US.

Potential Commercial Applications

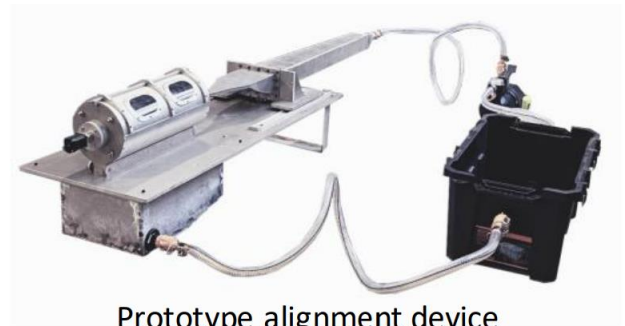
This technology is a significant advance in the viability of fibre-reinforced plastic recycling, which may open-up new opportunities in areas including:

- Recycled CFRP composites for wind turbine, automotive, aerospace, sporting equipment, mining and defence parts
- Carbon fibre-reinforced construction materials

- Carbon fibre 3D printing filaments
- Recycled carbon fibre consumer products

Inventors

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Prototype alignment device



Randomly oriented recycled fibres



Re-aligned recycled fibres

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