CirCarBio: Smart and circular composite materials

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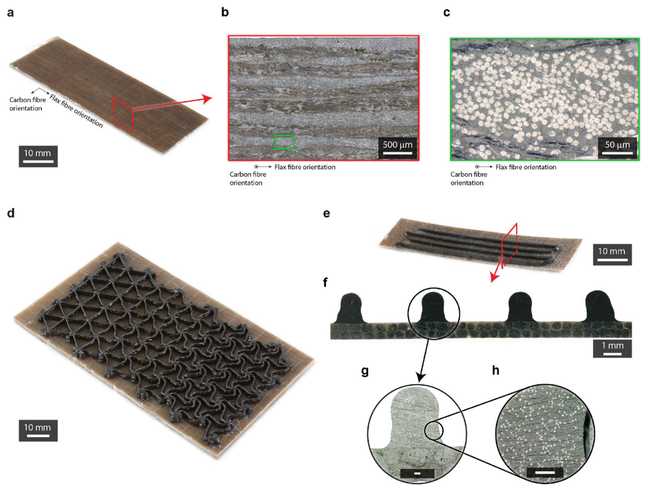
BACKGROUND

Anisotropic biological materials, such as wood or bone, exhibit lower embodied energy and remarkable mechanical properties through the shaping of chemically simple building blocks into hierarchical architectures. The structures of biological materials are built with an exact chemical composition and sequence that enables precise folding into complexes to facilitate their function as well as enable repurposing. This encourages the development of high-performance materials that serve in stress critical scenarios, and could be recycled.

HOW?

We propose to address this challenge by developing fundamental new understanding on the development of new microstructures and shaping of discontinuous recycled carbon fibres and using them in manufacturing of biologically-inspired composite materials with unprecedented heterogeneous architectures. Recycled fibre materials offer great promise through their second application life cycle in stress critical applications if key hurdles can be addressed.

1. Discontinuous Carbon fibre reinforced protein composites



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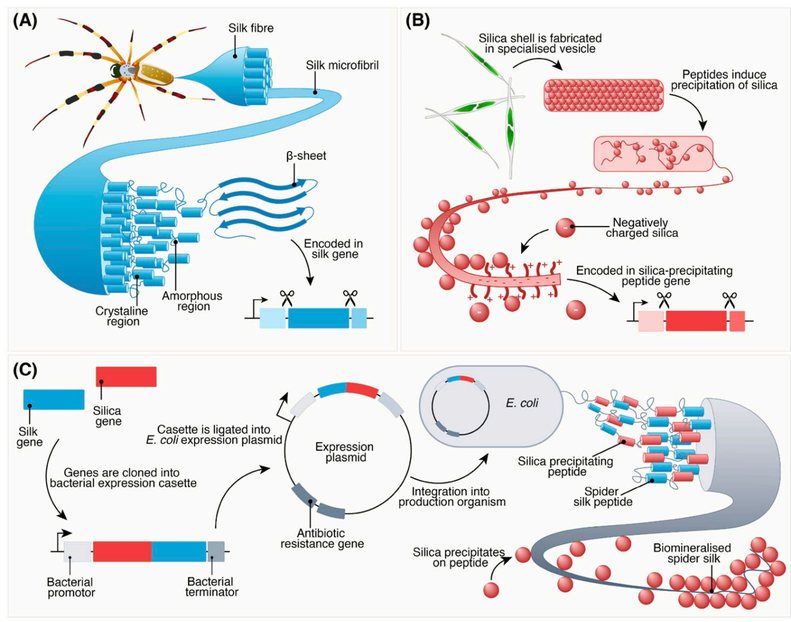
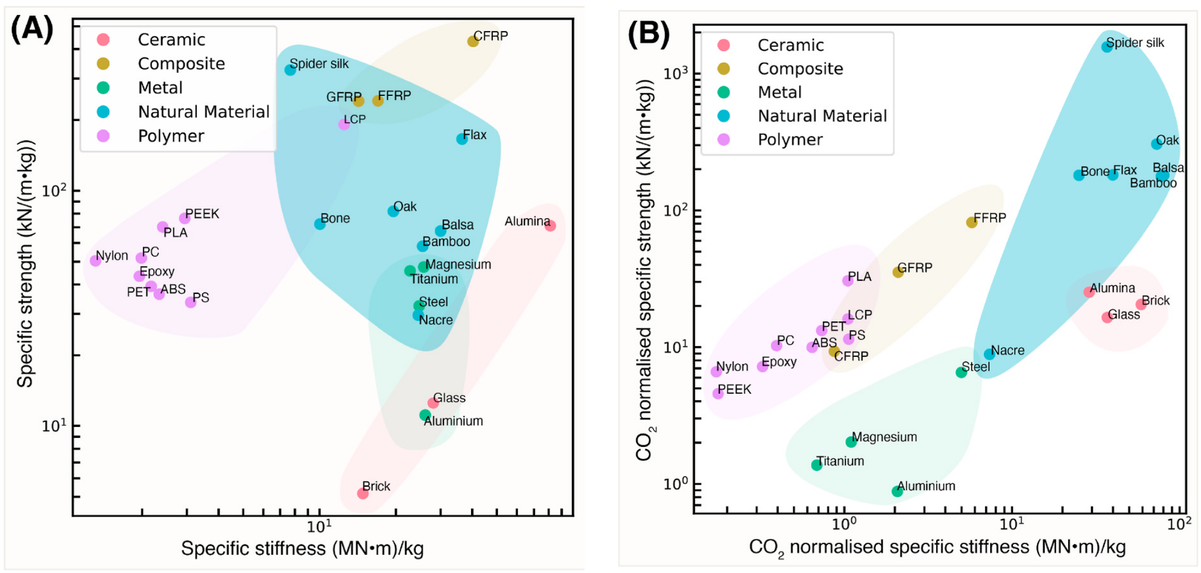
Fully recycled fibres (VCarbon)

2. Designer protein matrices & biomineralisation



RESULTS



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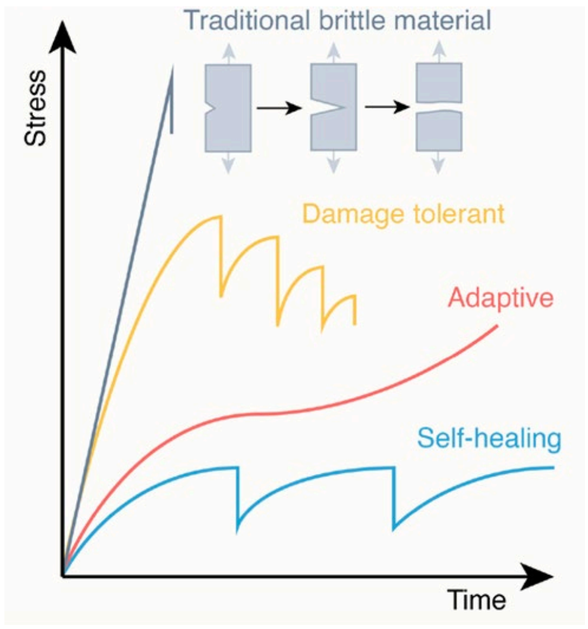

We propose to field, for the first time, engineered living composite materials.

The approach promises to offer a highly sustainable route to more intelligent and circular carbon fibre composite materials systems that will play a major role in our sustainable aviation goals for 2050.

Promising Research Knowledge Event | 21 November 2024

Acknowledgement
This research is conducted within the research and innovation programme Luchtvaart in Transitie, which is co-funded by the Netherlands National Growth Fund

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