

Manufacturing Composites with Dual Structural and Energy Storage Functions

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Aims / Objectives

The idea of storing electricity in structural composites is becoming increasingly popular. The weight of batteries or supercapacitors can be substantially reduced if their functions are passed to load carrying structures. The use of porous aerogels, pursued in Imperial College London, allows for the incorporation of storage functions in the composite laminates to create structural supercapacitors.

Aerogels are stiff and brittle which presents a challenge for manufacturing of complex components. This project tackles the problem of supercapacitor composites formability. Incorporation of internal impermeable barriers and stabilising elements enhance formability and aim at creating a hybrid multi-matrix structure where high shear regions remain purely structural while energy storage functions are applied in appropriate areas.

PLA Masking and Carbon Aerogel Infusion

Purely structural regions are protected by a PLA mask before infusion of Carbon Aerogel.



Infused with Carbon Aerogel



After infusion

Pyrolyzed





Bottom view

In this state the sample is ready to be formed but is also brittle highly susceptible to damage.

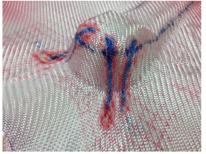
Carbon Fibre masked with PLA

Formability Manufacturing Trials

Resin patches are placed on dry fabric to enhance the formability of high shear zones and prevent wrinkling. These are intended to stabilize the fabric in critical zones whilst avoiding excessive bending resistance.







Dry woven glass fabric formed in a mould Glass fabric with stabilising resin patches

Comparison of shear angles at each corner of the stabilised sample shown left. Corner 1 20,00 A B Corner 4 Position Around Corner

Patch Characterisation

The resin properties are identified through the use of an adapted bias-extension test. This is a new approach, the accuracy of which is currently being assessed.

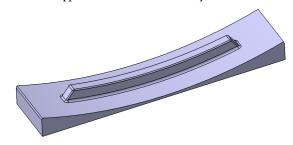






Multi-Matrix Formability Demonstrator

A large scale demonstrator is in production to show the practical application of a multi matrix system.



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