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CIMComp EPSRC Future Composites Manufacturing Research Hub

EPSRC Engineering and Physical Sciences Research Council

Hierarchical carbon fibre based composites

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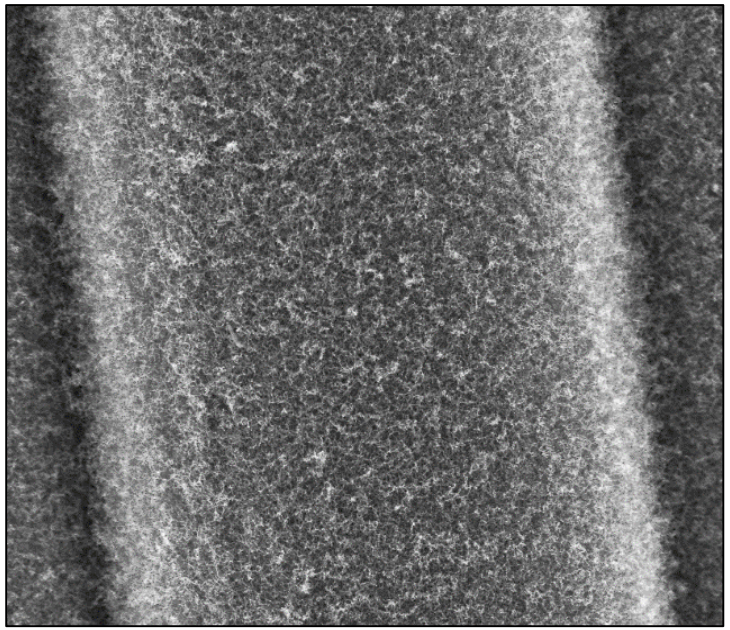


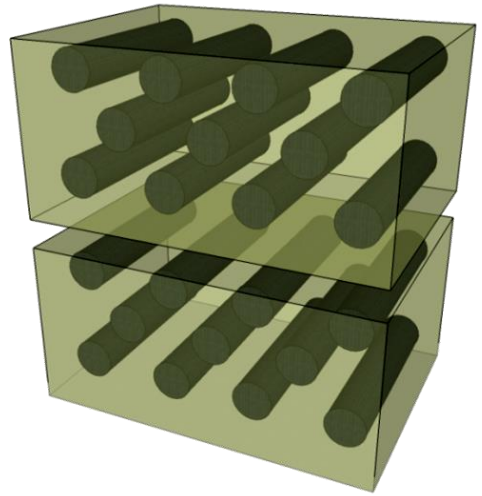
JEC World 2020 Technical Conferences
Carbon - what materials and processes for the future?

Wednesday 4th March 2020
11:15 - 11:40
Conferences (Hall 6 - Room 611)

JEC WORLD 2020 The Leading International Composites Show
March 3-4-5, 2020 | PARIS-NORD VILLEPINTE

Overview

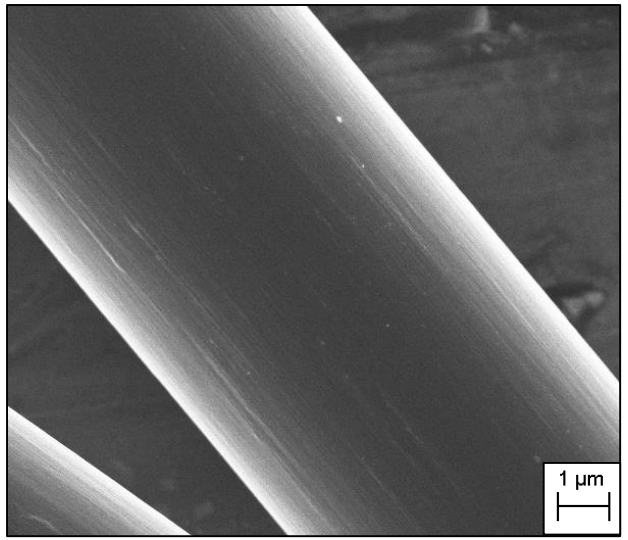
- Why alter interfacial properties?
- Production of hierarchical structures
- Implementation and scale up



Abstract

Fibre surface modifications can address conventional fibre-reinforced composite issues; for instance the formation of critical clusters of fibre breaks, or poor interfacial properties. Hierarchical interphases which modify the failure mode or increase mechanical interlocking can address these issues at the critical fibre-matric interface. Here, we will discuss our research which exploits nanoscale structured materials which are integrated into conventional composite fibre systems.

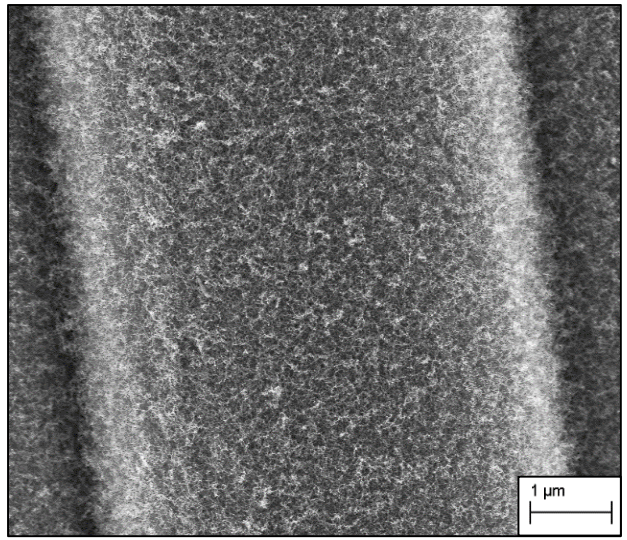
Carbon nanotube-grafted-carbon fibre (CNT-g-CF)



Carbon fibre
~7 µm diameter, continuous

CVD
Fe + Ni based catalyst
760 °C
C_2H_2 +H_2 in N_2

Continuous production
ca. 2 metres per hour



Carbon nanotube-grafted-carbon fibre
~7.2 µm diameter, continuous
(nanotubes ~10 nm diameter, ~200 nm length)

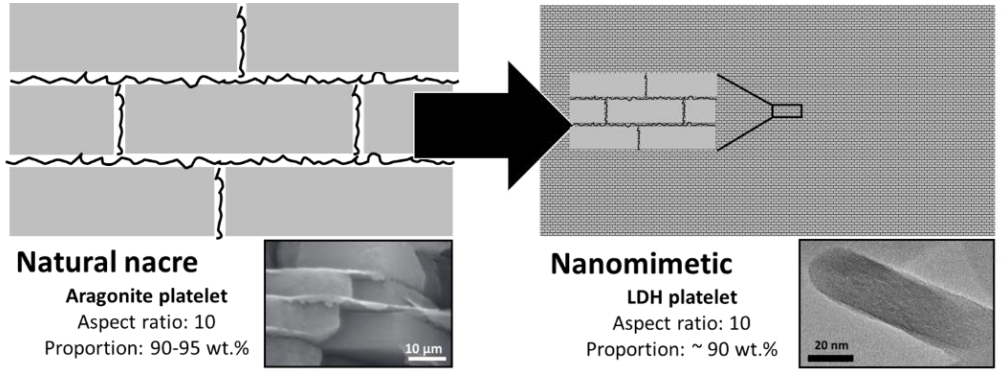
Nanostructured Hierarchical Assemblies and Composites (NanoHAC) Group
http://www.imperial.ac.uk/nanostructures-and-composites

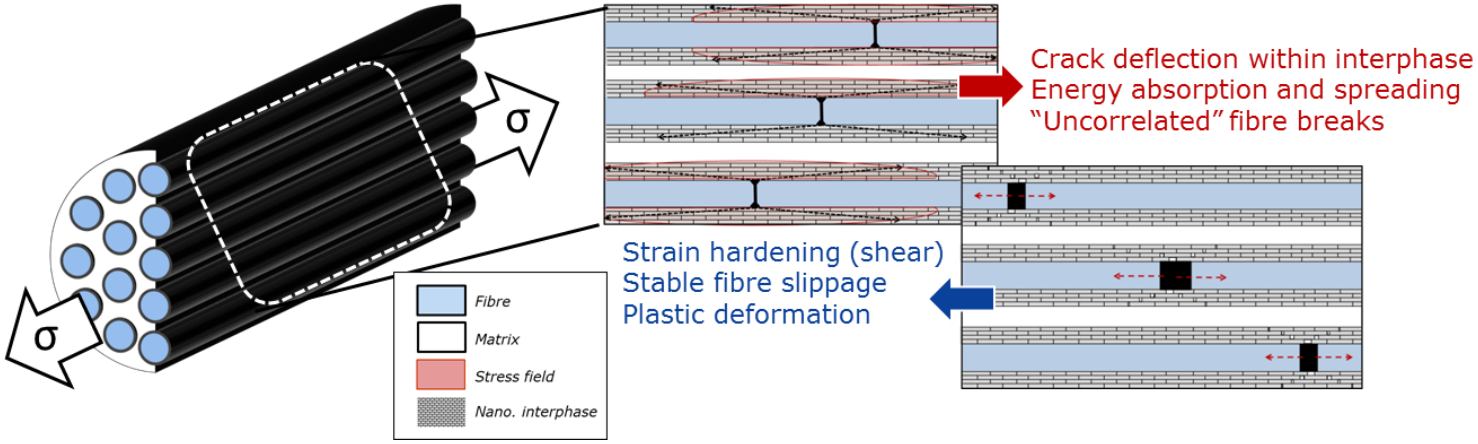
Composite Part A: Applied Science and Manufacturing, Vol: 112, Pages: 525-538 (2018)
DOI: 10.1016/j.compositesa.2018.05.027

Patent Application: *Process for producing carbon-nanotube grafted substrate*
USPTO Patent Application Full Text and Image Database, 20170198390

Nacre, Wikipedia

Altering the composite failure mode using a brick-and-mortar coating



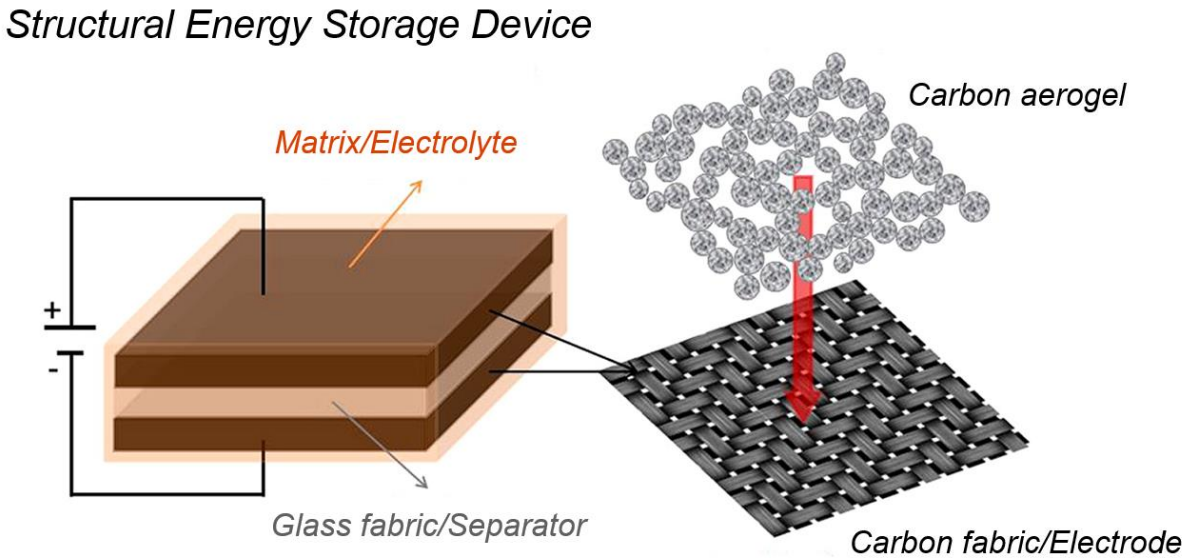


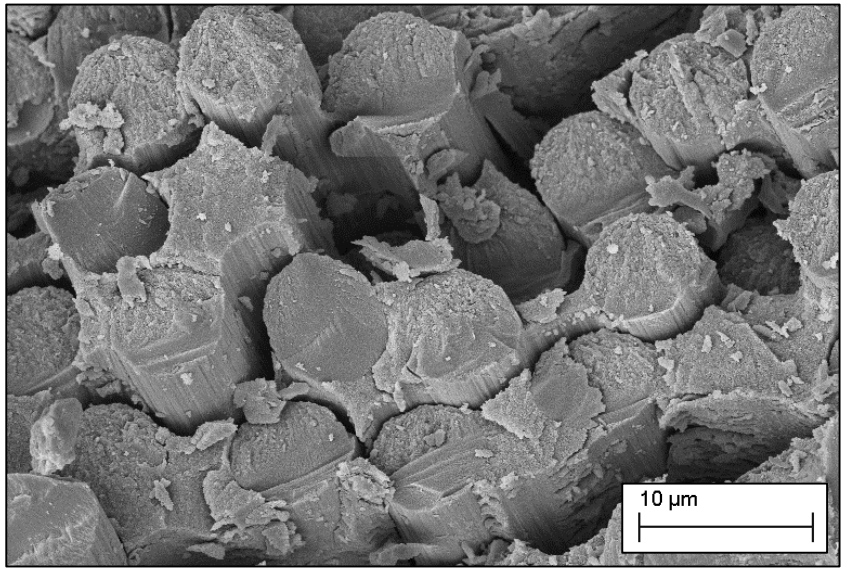
The Polymer and Composites Engineering (PaCE) Group
https://mc.univie.ac.at/pace

Materials Horizons, Issue: 5, Pages: 668-674 (2018)
DOI: 10.1039/c7mh00917h

Patent Application: *Composite Material*
European Patent Office (Espacenet), WO2018109486A1

Carbon aerogel modified composite structures





Structural Power Composites Group
https://www.imperial.ac.uk/structural-power-composites

ACS Appl. Mater. Interfaces, Vol: 5, Issue: 13, Pages: 6113-6122 (2013)
DOI: 10.1021/am400947j

Patent: *Energy Storage Device,* USPTO Patent Full Text and Image Database, 8,659,874
Patent: *Electrolyte*, USPTO Patent Application Full Text and Image Database, 20110189579

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