Materials Theme
Fabrizio Scarpa
We develop novel generations of composites, with a broad range of multiscale reinforcements, from nanostructures to carbon and natural fibres, involving design, modelling, manufacture and testing.
Highlights of 2021


- EPSRC Fellowship (£1.5M, SJE PI) and ERC AdG (£2.03M, FS PI)

- UKSA (£160K), Rolls-Royce (£140K), NCC Pull Through (£36K), RSC Research Enablement Grant (£50K)

- Lineat Composites spin out established in summer 2021

- IH, SJE, and FS gave keynotes to international conferences/workshops
Professor Stephen Eichhorn awarded £1.5M EPSRC Fellowship with Equality, Diversity and Inclusion focus

19 January 2021

Professor Stephen Eichhorn from the Bristol Composites Institute and University of Bristol’s Department of Aerospace Engineering has been awarded a £1.5M Fellowship from the Engineering and Physical Sciences Research Council, recognising outstanding research and leadership.

The title of the 5-year fellowship is ‘Realising Functional Cellulosic Bio-Based Composites’. The technical work of the fellowship will focus on biobased and sustainable composites using cellulose towards functional materials. The Equality, Diversity and Inclusion aspect of the work will aim to improve the experiences and inclusion of Black students and staff.

£2M ERC grant awarded to Professor Fabrizio Scarpa from the Bristol Composites Institute

21 April 2021

A grant of more than two million pounds has been awarded by the European Research Council (ERC) to an international research project, led by the University of Bristol, which will use natural plant fibres, bacteria, enzymes and spider silk to create materials that mimic how the human brain works.

BCI Conference 2021 - Materials
09/11/2021
Highlights of 2021

UK composites set for space testing on ISS

Written by: Andrew Wade | Published: 07 July 2021

New composite materials developed by researchers at the University of Bristol will be part of an upcoming mission to stress test materials in space.

Due to launch in spring 2022, the Euro Ageing mission will see 45 different materials from various participants sent to the International Space Station, where they will be encased in a chamber on the Bartolomeo platform especially designed by Airbus. Once in place, they will spend six months exposed to the harsh space environment, enduring micro-meteoroids, temperatures from -150°C to +150°C, high velocity dust, severe electromagnetic radiation and space debris. Real-time data will assess how the materials are performing and help scientists improve materials for the next generation of space missions.
Highlights of 2021

- Workshop organized by BCI and Bristol Bio Design Institute
- Create a design space at the interface between sustainable composite materials and synthetic biology
- Led to a UK BBSRC Transition Award application within the UKRI National Engineering Biology Programme 2021
Highlights of 2021


Hierarchical network structural composites for extraordinary energy dissipation inspired by the cat paw. W Lu, Q Zhang, F Qin, P Xu, Q Chen, H Wang, F Scarpa, HX Peng. Applied Materials Today 25, 101222 (with ZJU: https://tinyurl.com/cxt88t4d)
Highlights of 2021

- Technique for creating strong and moldable wood materials via a rapid "water-shock" process.
- After dismantling the wood’s lignin which softens it, and then closing the fibres via evaporation, the wood re-swells by "shocking" it with water.
- The resulting 3D-Moulded Wood is six-times stronger than the starting wood and comparable to widely used lightweight materials like aluminium alloys
- Team Led by U Maryland and Steve Eichhorn

(Xiao S et al., 2021. Lightweight, strong, moldable wood via cell wall engineering as a sustainable structural material. *Science* 374, 6566)
Dr Neha Chandarana  Lecturer in bio-based and sustainable composites

Fusion of acoustic emission monitoring and FE-based simulation for damage characterisation in composites

In situ strain monitoring with distributed optical fibre sensors

AE-based location

Matrix cracking in 45

Delamination?
Ian Hamerton

Patrick Sullivan: wheelchair ramp infused using rCF (from aircraft rudder)

Usman Sikander: effects of plasma on ILSS of CF/epoxy/Dyneema laminates

Matt Bone: MD simulation of polyurethane coating coalescence

New spin out company – HiPerDiF technology

HiPerDiF 3G now located within NCC

Will Proud: LCA data for different laminates

Chantal Lewis: HiPerDiF rCF laminate

Dan Griffin: relationship between deposited braid angle and convergence cone curvature (as a proxy measurement to enable adaptive process control in over-braiding)

Xray CT image of CFRP for space use

HiPerDiF Tape

Cured laminate

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Jacob Goodenough: debonding adhesives through induction heating
S Rochat – microporous polymers and composites

- **Polymers for energy conversion**
  Sustainable production and storage of synthetic fuels

- **Light-controlled composites**
  “etch-a-sketch” conductive patterns

- **GWPOre**
  International network of researchers in porous materials, based in the South-West.

  **February 2021**: GWPOre Meeting on Porous Materials for a Sustainable World

  **December 2021 (to be announced)**: GWPOre Christmas Meeting (with keynote speaker, ECR presentations, and social evening – all online)
Dr. Jemma Rowlandson

Major Research Themes

- Porous Materials
- Hydrogen Systems
- Sustainable Systems & Materials
- Methods of Optimisation
- STEM Engagement
- Widening Participation
- Impact on Communicators

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F Scarpa – bio-based materials and metamaterials

- Biobased materials and sustainable composites (flax, sisal, hemp, bamboo, hydrogels, recycled plastics)
- Work covered in BBI SSUCHY, ONR and collaborations (USFJ and UGuelma)
- Auxetic Metamaterials developed via architected foams, meso and macro configurations
- Bioinspired Hygromorphs at the interface between meta and biobased materials (with IRDL)

- Showcase and Workshops held
- Look at the calendar
- Enroll!

https://metamaterials.network/
Prof. Valeska Ting
Professor of Smart Nanomaterials

Zero-carbon flight: working with industry to develop hydrogen-powered aircraft

Superconductive composites: developing high temperature superconductive composite materials

Porous MOF nanocomposite melts: first room temperature liquid metal-organic framework nanocomposites developed for gas capture

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Conclusions

- Over 59 papers published so far
- Theme currently composed by 9 academics and 69 members between PhD, PDRAs, and Technicians.
- Truly multidisciplinary outlook. Strong push towards sustainability. Interface with SynBio and biomedical
- Open to widespread national and international collaborations
- Close collaboration and alignment with industrial and NCC Core Research Programmes
Thank you
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