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Welcome to the 2024 winter edition of the Hub Newsletter

Research

Researchers Network Event – 20-21 September 2023

The Researchers Network hosted its largest career event to date in Bristol on 20-21 September. Hub Researchers were available to present, among other presentations, their research projects awarded last year under the Researchers Network Awards. These awards are designed to complement and create synergy with existing Hub funded projects, and to give younger researchers the experience of developing and managing their own projects, these were:

“Manufacturing and modelling of variable thickness near-net-shaped 3D woven composites for complex aerospace structures” Ulster University and the University of Nottingham.

“AITROCOMPS:AI-driven through-thickness reinforcement design optimisation for multifunctional composite structures” Cranfield University and Brunel University, London.

Industry speakers from The National Composites Centre, Lineat, GKN and Leonardo were invited to present to the group. It was a great opportunity for the students and researchers to see examples of people working in Catapults, Start-ups and large organisations in the field of composites manufacturing.

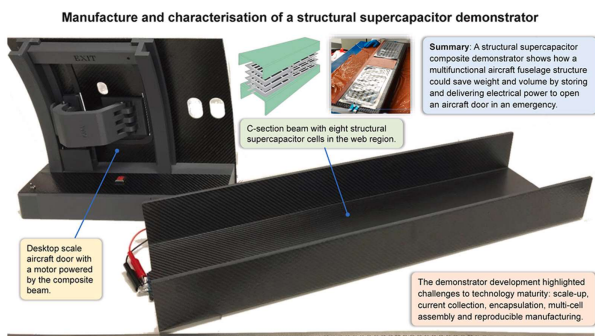
The event concluded with a tour of Leonardo Helicopter facilities, Yeovil and a group dinner with the Society for the Advancement of Material and Process Engineering (SAMPE).



(Left) Industry speakers Q & A session and (Right) Presentations from Researcher Network funded projects.

Researchers Network

Publications



Manufacture and characterisation of a structural supercapacitor demonstrator.

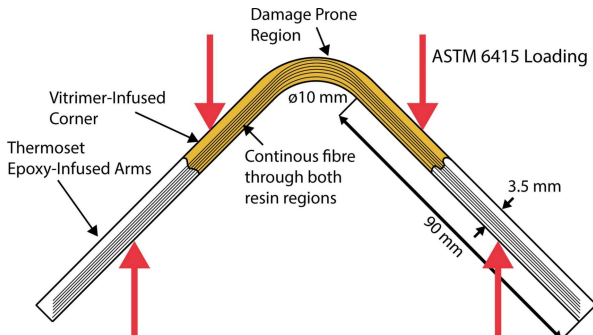
Nguyen, S., Anthony, D.B., Katafiasz, T., Qi, G., Razavi, S., Senokos, E., Greenhalgh, E.S., Shaffer, M.S.P., Kucernak, A. R.J., Linde, P. (2024)

“Manufacture and characterisation of a structural supercapacitor demonstrator”.

Composites Science and Technology, Volume 245, Issue 5, Pages 110339.

Grant Number: EP/P006701/1.

[View Publication](#)



Multi-Matrix Continuously-Reinforced Composite (MMCRC)

demonstrator structure, showing key dimensions and

loading locations for testing used.

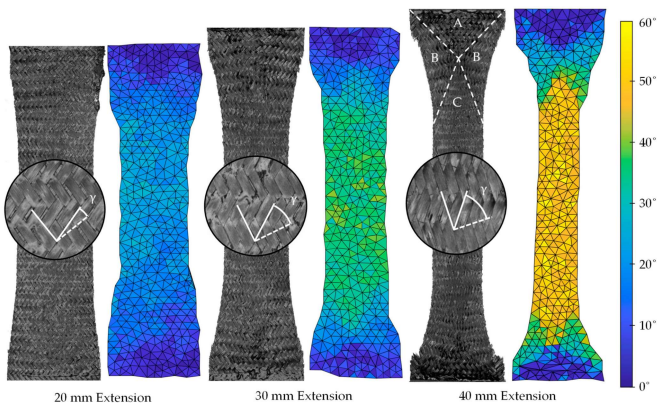
Palubiski, D.,R.,Longana, M.L., Dulieu-Barton, J.M., Hamerton, I. and Ivanov, D.S.(2023)

“Multi-matrix continuously-reinforced composites: a novel route to sustainable repair of composite structures”.

Materials and Design, Volume 235, Pages 112446.

Grant Number: EP/P006701/1.

[View Publication](#)



Relationship between shear angle and axial displacement

of 4-ply, 250 °C (isothermal), 100 mm/min bias extension

specimens at 20 mm, 30 mm and 40 mm displacement,

respectively.

Street, G.E., Johnson, M.S.(2023)

“The Intra-Ply Shear Behaviour of Non-Isothermal Thermoplastic Composite Laminates”.

Journal of Composites Science, Volume 7, Issue 10.

Grant Number: EP/P006701/1.

[View Publication](#)

Hub Publications

Hub Outreach

Advanced Engineering Show, NEC, Birmingham - 1-2 November 2023

The Advanced Engineering Show (AES) is the UK's largest annual gathering of engineering and manufacturing professionals, attracting more than 9,000 visitors. The Hub joined more than 400 exhibitors at the event, to showcase its activities and capabilities to visitors. On the second day, Hub Director Professor Nick Warrior and Hub colleagues participated in the Composites Forum by presenting research from four of its Core Projects: **The merging of deposition, consolidation and curing into a single manufacturing step by Layer by Layer curing; the use of structural power composites in lightweight electric transportation; NDE and control of resin injection into heterogeneous reinforcement; and design simulation tools and process improvement tools for NCF preforming.** The forum was well attended and the Hub made a good contribution to the innovation theme of the programme.

The show was an effective forum for the EPSRC Future Composites Manufacturing Research Hub to engage and network with the UK composites community, both with those with an existing relationship and new contacts. There have already been several follow-up conversations to discuss future engagement with the Hub.



The CIMComp stand at the AES attracting discussions from members of the composites community.



Dr Andreas Endrweit presenting at the Composites Engineering Forum at the AES, on his research project 'Active RTM: Resin injection into reinforcement with uncertain heterogeneous properties: NDE and control'.

University of Nottingham Post Doctoral Researcher Delivered Online Conference

In September 2023 Dr Jesús Molinar Diaz participated as a speaker in delivering an online conference to Biomedical Engineering students from the UACJ (Autonomous University of Juarez City) in Mexico. The focus of Jesús's presentation was on the Composites Hub and his research and experience in the UK.



Dr Jesús Molinar Díaz delivering his presentation to Biomedical Engineering students from the UACJ (Autonomous University of Juarez City) in Mexico.

Hub Training and Equality, Diversity & Inclusion (EDI)

In this edition, we welcome an EDI experience provided by Dr Ian Gent, Composite Research Engineer, GKN Aerospace: **Understanding Neurodiversity**. Ian Gent is an alumnus of the Hub (2017-2020) and currently works as a research engineer at the GKN Aerospace Global Technology Centre (GTC) in Bristol. Ian worked on the Core Project: **“Manufacturing for structural applications of multifunctional composites”**. He is open about being neurodiverse and alongside his technical responsibilities is voluntarily working to raise awareness of neurodiversity within GKN Aerospace with a goal to make the company more inclusive to all employees and visitors. Neurodiversity is the idea that neurological differences in the human brain are natural. It challenges the traditional medical model that views these differences as needing to be cured, recognises the strengths and potential of neurodiverse individuals and promotes the acceptance, accommodation, and celebration of these differences. Neurodiversity is usually associated with conditions such as autism, ADHD, or dyslexia, but also encompasses many other neurotypes. Official UK statistics say that ~1 in 7 people are neurodiverse. Below is a summary from an interview with Ian conducted in December 2023.



Dr Ian Gent, Composite Research Engineer, GKN Aerospace.

“I was diagnosed as dyslexic at 18, but, I do not exhibit stereotypical dyslexic traits. My dyslexia is less to do with my literacy ability, and more to do with my struggles with short-term memory, which leads to slow writing speed and difficulties in completing sentences. I was lucky that I was supported at both school and university before and after my diagnosis by being allowed extra time in exams and the use of assistive technologies. Later, I self-diagnosed myself as being both autistic and an ADHD (Attention-deficit/hyperactivity disorder) during my PhD due to the challenges that I could not attribute to what I knew of dyslexia. I am seeking professional diagnoses for both of these conditions but I strongly feel that people should be able to access the help that they may need without an expensive and time-consuming (an ADHD diagnosis can be a 3-7year wait) diagnosis process. I also do not need the legal protections of a diagnosis due to my previous dyslexia diagnosis, I struggle with subjectivity, and I want to remove some of what I feel around my personal situation and aid my mental health. I feel that due to the current state of the NHS in the UK, diagnosis processes can also be inherently unfair.

My personal experience of an autism assessment was being offered a triage appointment after being on the waiting list for a year and then being discharged from the autism service because I was not in mental health crisis,

I had a job, and I could “communicate with nuance and humour”.

Masking, or hiding traits to fit in socially, is a big issue for female and adult neurodivergent people, which I do not feel was properly assessed in this appointment. I see neurodiverse traits in two ways – weaknesses or strengths. On the weakness side, something that seems like a quirk to a neurotypical person may be completely debilitating for a neurodiverse person. For example, the desk that I like to use has been removed from the hot desk system because I can be badly affected by changes in routine. If I was to arrive and find someone else sitting in that location, it could completely throw my focus for half a day or more. As for strengths, neurodiverse people can excel in attention to detail, and out of the box thinking due to the different way that their brains may process information. A lot of high performing people in STEM, business, and popular culture are neurodiverse. When I joined GKN Aerospace, an autistic internship programme with the University of the West of England was starting. I became a mentor to the two interns and one of them was hired as a full time engineer after their internship. After this, I was approached by our HR team to set up a local version of our “Mastering Neurodiverse Strengths” Employee Resource Group, with the intention to educate GTC residents about neurodiversity and make the work environment more inclusive. I gave a presentation as an introduction to neurodiversity, which was well received. In addition, we have assigned neurodiversity to all present and future GTC residents and GKN Aerospace have signed up to the Neurodiversity in Business Charter. I am very passionate

about neurodiversity because it is an inherent part of myself. As a result, I am not shy in saying that I am neurodiverse publicly and people at GKN Aerospace have acknowledged me for making it more normal to disclose neurodiversity within the company, which I am proud of”.

Equality, Diversity & Inclusion

Other News

Staff Promotions

The Hub would like to wish **Dr Oriol Gavalda Diaz** the very best with his promotion to lecturer at Imperial College, London.

Oriol leaves his role as Transitional Fellow and Chair of the Researchers Network at the University of Nottingham. The Hub would like to thank Oriol for his contribution to his role and welcome **Ángela Lendínez Torres** who will be transitioning into the role of Chair of the Researcher Network this month.

Staff News



PhD Student Dominic Kelsey, University of Nottingham.

The Hub would like to welcome PhD student, **Dominic Kelsey, University of Nottingham** as he commences his research work on laser cutting of carbon fibre composites.

“In 2023, I graduated from my MEng degree at the University of Nottingham in Mechanical Engineering. My dissertation focussed on investigating the effect of defects within CFRP on mechanical properties.

After graduating, I started a PhD on laser cutting and drilling of ceramics. This PhD focuses on the laser material interaction and material removal of composites and ceramics. This experimental PhD aims to understand the cutting process and

thermal damage, in order to increase quality in laser cut parts. This project is joint with the University of Nottingham and the MTC”.

Industrial Doctorate Centre in Composites Manufacture: Showcase 2023

The Industrial Doctorate Centre (IDC) welcomed over 40 guests to the annual Showcase event, on the 19th September 2023, held at the Watershed in Bristol. The event was followed by a gala dinner at Bristol Harbour Hotel. IDC in Composites Manufacture has now reached its 10th year, and over this time, 31 students have graduated with an EngD in Composites Manufacture. The IDC recently welcomed five new students, bringing the total number of students currently enrolled to 20. The new students were excited to attend the Showcase along with existing IDC students, alumni, academic and industrial supervisors, and were joined by a group of specially invited VIP guests, with strong connections to the UK composites sector. It was a great opportunity for students to present their research work to a wider audience and network within the industry. The day consisted of 3 oral presentations sessions and a quick-fire poster session chaired by the IDC alumni. The presentations from the students ranged from topics in advanced manufacturing techniques, new approaches to testing wind turbine blades, process simulation and effect of cryogenic exposure on composites. A focus of the showcase was sustainability, this was brought in to context in a fantastic keynote speech from Dr Ffion Rodes. One of the ambitions for the IDC is for the students to create their own spinouts and companies. Dr Tomasz Garstka a PhD alumni from Bristol Composites Institute has done just that creating his company LMAT. Tomasz gave an excellent keynote presentation on how he turned his academic research into a commercial tool for composite manufacture. The Showcase ended with a very lively panel discussion, chaired by Prof Mike Hinton of the High Value Manufacturing Catapult. The panel comprised Dr Anna Scott Magma Global; Dr Petar Zivkovic Airbus; Dr Peter Giddings NCC; Dr Faye Smith, Avalon Consultancy; Professor Paul Hogg, Royal Holloway University of London; Janet Mitchell, MC2Consultants. The panel were asked to discuss how can industrially-based doctoral research help unlock the potential of composites in achieving a Net Zero? The topics discussed included: Understanding better how digital technologies can help accelerate our learning; start thinking of composites as an enabler to protect our way of life by integrating sustainability at the design stage, creating a template for LCA that can be used in all projects; extended in-service life of composites and life extension programmes; smarter testing to reduce waste and move to virtual tests for certification; take steps to eliminate trial and error approaches in manufacturing; move away from the driven by rate approach. The event was a great success with engaging discussions throughout the day carrying on into the evening at the reception and the gala dinner. Prof Janice Barton, Director of the IDC was delighted with the day and said *“It was fantastic to see our students present their work with confidence and realising they are making a significant difference to their sponsoring companies and to wider society”.*



Keynote presentations and images taken from the The Industrial Doctorate Centre (IDC) Showcase event.

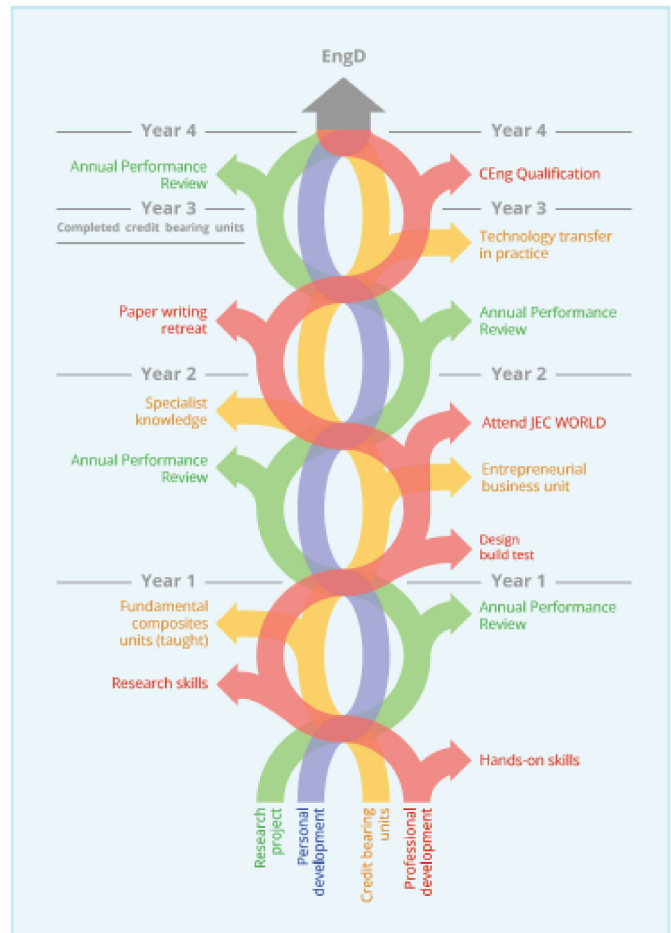
New format Industrial Doctorate Centre (IDC) on Composites Manufacturing

In September the new IDC taught component and professional development programme was launched. The programme includes new units have sustainability as a common theme in materials, manufacturing and design. The professional development programme has been developed with the National Composites Centre and includes a new Design, Build and Test competition, as well as other activities such as helping students develop a portfolio of activities for Chartered Engineer status. The pictogram below shows how the taught component, professional and personal development are intertwined with the research. A key feature in year 3 is a Technology Transfer in Practice secondment to another organisation, or different part of the sponsoring organisation, with interests related to the student's research. The host organisation is of the student and sponsor's choice and could be e.g. industry, charitable organisation or governmental body. The secondment and following assessment is designed to enable personal development by providing an opportunity to consider how knowledge developed in the research project influences a different part of the sponsoring organisation or another sector to provide a deeper understanding of a diverse business opportunities. It offers an opportunity to reflect on experience and the wider ranging impacts of the research discoveries, on society, and the environment.

Six students have embarked on the new programme all sponsored by the National Composites Centre.

| Name | Research project Title |
|----------------|--|
| Jack Davies | Reducing waste and cost in large scale infusions through adaptive process control. |
| Jenny Banks | Recycled fibre/matrix interfacial properties. |
| George Holiday | Composite shielding against directed energy weapons. |
| Erica Barnes | Through life damage and environmental assessment. |
| Kieron Guiote | Large scale rapid infusion of aircraft wings. |
| Matthew Miller | High-rate automated deposition. |

If you are interested in sponsoring an EngD student who will spend up to 75% of their time located in your company/organization please contact janice.barton@bristol.ac.uk



CIMComp Follow on project receives EPSRC grant funding

Hub Synergy project “**Monitoring of Microwave Cure Process using Novel Planar Optical Sensors**” led by Prof Janice Barton, University of Bristol, Prof Richard Day, Wrexham University and Dr Chris Holmes, University of Southampton was a research project funded from the Hub’s first Synergy call in 2020. The 15K Synergy projects were derived from interactive group sessions amongst Hub members which presented opportunities to identify and build on project synergies and formulate ideas for future Hub projects. The success of this collaboration has progressed to an EPSRC £2million funded project on “**Novel Flat Optical Fibre Sensors for Application in Process Control, Evaluation and Health Monitoring of High Value Composite Assets**”, which is a collaboration between the University of Bristol, University of Hertfordshire, University of Nottingham, University of Southampton, University of Warwick and Wrexham University.

The Hub would like to congratulate the team on this collaboration and they look forward to seeing the research progress.

CIMComp Follow on project receives Researcher in Residence programme grant

Dr Mike Johnson has been granted a ‘Researcher in Residence’ programme to commence in January 2024 and will run until June 2025. It is a £50K funded

programme led by the Innovation Launchpad Network+ Researchers in Residence Scheme and it will be sponsored by the National Composites centre (NCC). The aim is to build a manufacturing cell for fibre reinforced thermoplastic sheet forming. The grant has evolved from a Feasibility study that the Hub sponsored in 2020 on “**Incremental sheet forming of fibre reinforced thermoplastic composites**”. The Hub wish Dr Johnson and the team the very best with the grant.

An £80m boost to composites research and development for aerospace manufacturing in the UK

In November of last year leaders from industry, academia and government gathered in Sheffield to break ground for a University of Sheffield AMRC innovation facility and research project led by global aerospace company Boeing, which will put South Yorkshire at the forefront of UK aerospace manufacturing.

Composites at Speed and Scale (COMPASS) is a major boost to aerospace research and development in the UK, helping solve composites manufacturing challenges needed to meet future demand for lighter commercial aircraft and help the aviation industry reach net zero by 2050. The new research facility will house the Boeing-led Isothermic High-Rate Sustainable Structures (IHSS) project.

Project COMPASS builds on the AMRC’s world-class composites and automation capabilities to de-risk the development and manufacture of high-rate, large-scale composite parts, providing wider UK industry with a unique open-access facility to develop, demonstrate, test and validate new composite manufacturing technologies and capabilities.

The combined £80 million research facility and IHSS project, announced last year in partnership with Loop Technology and Spirit Aero Systems, is jointly-funded by industry, key stakeholders and the UK Government’s Aerospace Technology Institute (ATI) Programme; a partnership between Department for Business and Trade, ATI and Innovate UK.

The undertaking will initially create around 50 jobs in South Yorkshire and, based on forecasted aircraft demand, has the potential to create up to three thousand UK jobs long-term, and around £2 billion annually in export opportunities.



[Click here for more information](#)

AMRC CEO Steve Foxley; Chief Technology Officer of Boeing, Todd Citron; and Boeing President, Maria Laine, on site for the ground breaking of the new AMRC innovation facility in Sheffield.

International Exchange Visit - September 2023

The Hub supported PhD researcher, Aiden Hawkins, Queens University, Belfast in an exchange to the USA where his research focused on **'Novel Layup Optimisation Methods in Design and Manufacture of Advanced Fibre-reinforced Laminated Composites'**.

Aiden embarked on an informative composites trip, his itinerary commenced with travel to Honolulu, Hawaii where he met with his external PhD supervisor Professor Stephen Tsai and shared discussions on his latest unpublished work on Double-Double (DD) laminates and proposed novel areas for investigation. Aiden had the opportunity to share his latest work on homogenisation and stiffness matching of DD laminates. Aiden commented *"My PhD is focused on Double-Double(DD) laminates, a new layup design approach which seeks to address the limitations of quad laminates. First proposed Professor Stephen Tsai in 2017, DD has the potential to simplify the design of composite structures, reduce manufacturing complexity and allow for simplistic and rapid thickness tapering, presenting substantial prospects for structural mass reduction. Professor Tsai provided valuable feedback on the best direction to proceed. It was amazing to see the enthusiasm and energy he has for his work at the age of 94. It was a truly inspirational experience"*.

Aiden spent time in Boston, Massachusetts, attending and presenting his work on DD laminates at the American Society of Composites Conference (ACS) which created the opportunity to build connections with people from US institutions and companies in the composites sector.

Aiden continued his exchange programme with a visit to Los Angeles, California. The first industrial stop was at the NASA Jet Propulsion Laboratory (JPL) A leader in robotic space exploration, where he hosted a seminar on DD laminates with supervisors Professor Tsai and Dr Ali Aravand. JPL were interested in the potential weight reductions and reduced launch costs achievable with DD laminates and the ability to accommodate new structural requirements late in the design process, with minimal to no disruption to the design schedule.

Aiden concluded his visit by hosting seminar's on DD laminates, covering the basic theory, advantages of the layup method and latest developments at both Northrop Grumman and California Institute of Technology (Caltech) which led to interactive discussions about future collaborations and an interesting tour of the institution's lab facilities.

The travel to the USA proved successful to spread knowledge of DD laminates and share the latest research advancements from Queen's University Belfast at conferences and research institutions. It introduced several different leading institutions and corporations to DD laminates and formed new relationships for future collaborations.



Prof. Stephen Tsai and Aidan Hawkins - Honolulu, Hawaii.



**Aidan Hawkins at the NASA Jet Propulsion Laboratory
(Los Angeles, CA).**

Career progression beyond CIMComp



Dr Albert Gibbs, Project and Composite Engineer on the Pentaxia stand at the Advanced Engineering Show 2023.

The Hub are delighted to have their logo feature on Pentaxia's stand at the recent Advanced Engineering Show, NEC. Dr Albert Gibbs (featured in left image) completed his PhD at University of Nottingham and the Hub in 2018 - 2023 with his main research focus on carbon composite manufacturing with a specialty in forming of composites and modelling of composites. Albert has now progressed his skills to the industrial sector, to the role of Project and Composite Engineer at Pentaxia, Derby. The Hub wish Albert all the best with his career.

"The University of Nottingham and the CIMComp Hub was instrumental in connecting me with both academic and industrial partners, providing me with the necessary tools and contacts to kickstart building a network. Even after transitioning into the industry, I've continued expanding this network. In my current role, I explore exciting technologies in composites. Without the Hub, I wouldn't have had the opportunity

to delve into the wide range of subjects being researched across the country.”

Upcoming Events

JEC World Paris-Nord Villepinte 5 - 7 March 2024

The EPSRC Future Composites Manufacturing Research Hub are pleased to announce that they will be exhibiting at JEC World 2024, it is the leading international composites show, which is held annually.

You will find us on the UK Pavilion, come and visit our stand (S62 & T62 in Hall 6).



[Click here for more information](#)

TexComp-15 in Leuven (Belgium) 1 - 13 September 2024

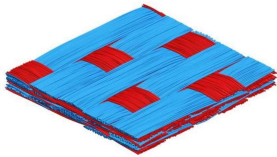
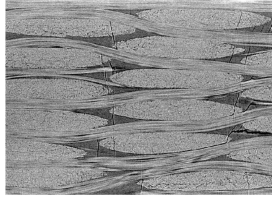
TexComp-15 Conference

11-13 September 2024 | Leuven, Belgium

KU LEUVEN

TexComp comes back home!

The Composite Materials Group (CMG) organizes TexComp-15 in Leuven, Belgium. TexComp is an international conference dedicated to composites, reinforced with textiles and other reinforcements with a complex fibrous architecture. The conference was initiated by Prof. Verpoest in 1992 in Leuven and toured the world ever since.



Scope

TexComp covers experimental studies, modelling, and case studies related to design, manufacturing, properties, performance, applications and sustainability of textile composites and their reinforcements. Research on composites produced by other advanced preforming technologies is also welcome.

More information



www.tinyurl.com/texcomp15
TexComp15@gmail.com

Important dates

| | |
|---|----------------|
| Abstract submission deadline | 31 Mar 2024 |
| Notification of acceptance and release of first programme | Jun 2024 |
| Early-bird registration deadline | 30 Jun 2024 |
| Late-bird registration deadline | 28 Aug 2024 |
| Conference | 11-13 Sep 2024 |

The international conference, TexComp-15 returns in Leuven (Belgium) in September 2024, covering experimental studies, modelling, and case studies related to design, manufacturing, properties, performance, applications and sustainability of textile composites and their reinforcements. Research on composites produced by other advanced preforming technologies is also welcome. It is a three-day conference, which will include keynotes (plenary), oral presentations in parallel sessions, and posters with a dedicated session of mini-presentations. The conference will be “abstracts only”.

- **Abstract submission deadline: 31 March 2024**
- **Early bird registration deadline: 30 June 2024**

Programme & Registration





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