# The BioComposites Centre
# ANNUAL REPORT 2021

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The BioComposites Centre
**ANNUAL REPORT 2021**

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BEACON
From plants to products
O blanhigion i gynhyrchion

Llywodraeth Cymru
Welsh Government

ERDF
Llywodraeth Cymru
Welsh Government
Ewrop & Chymru: Buddsoddi yn eich dyfodol
Cronfa Datblygu Rhanbarthol Ewrop
Europe & Wales: Investing in your future
European Regional Development Fund

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# Annual Report 2021

## Welcome and Introduction

In 2021 we continued to work in challenging circumstances, and this impacted on our teams' efforts in the labs and at our scale up facilities at Mona. Catching up on delayed projects was the focus this year. Working with our sponsors and collaborators to ensure projects were still in scope and could be delivered within the budgets were our 2 main priorities. Good project management and communication were critical to this success, and I would like to thank all our project managers, scientists, technicians, engineers and admin teams that made this possible!

This year we have continued to deliver on our international research projects with India, Uganda and China. We have developed new collaborations with industry, and we have secured new Innovate UK and Welsh Government funding. We are working with partners to address the challenges and issues faced by the foundation industries, in construction, pulp and paper and agriculture.

Looking forward we can see a growing demand in all these sectors. The farming industry faces many challenges in reducing their environmental impacts. We can help address these issues with work to develop new mulch films that boost crop yields without contributing to microplastic contamination; and we are helping to develop new bioactive compounds to reduce fertiliser usage; in the construction industry we are prototyping new materials to improve building performance; and in the pulp and paper sector we are helping the assessment of repulpability of fibre-based food packaging.

All this work is underpinned by Life Cycle Assessment (LCA). Interest in this as a method is rapidly growing. Recent successful collaborations with industry include the development of a carbon calculator approach. This is used to calculate the overall environmental impact of a product and includes an assessment of the confidence of accuracy. This is an example of where good scientific data is needed to support and inform the choices made by industry. Using LCA will help companies reduce their impacts; help them to plan their R&D spend and ensure future environmental claims are credible.

Looking to the future and building on these successes at a regional level will be key targets for the next 5 years. Strengthening our collaborative links with the University's Science Park (MSPARC) and working with the Centre for Environmental Biotechnology (CEB) we hope to expand the opportunities for local business to help them decarbonise, increase their R&D investment and contribute to the growth of our Welsh region.

*Dr Rob Elias, Director of the Biocomposites Centre*

*Dr Rob Elias: Director*

# National and International Funded Projects

## Monitoring and evaluation of building infrastructures

The development of energy efficient buildings through design and usage of appropriate building materials requires substantial knowledge and understanding of their indoor environmental dynamics to model and optimise design outcomes.

In 2019 Bangor University launched a £7M interdisciplinary research centre, the Smart Efficient Energy Centre (SEEC) to focus on carbon reduction. SEEC is funded by the European Regional Development Fund through the Welsh Government.

The principal areas of interest are in energy production from ocean and nuclear energy and energy efficiency in buildings by implementation of a cyberinfrastructure hub. The BioComposites Centre is leading the structures energy efficiency theme.

Environmental condition data loggers have been deployed to case study rooms, the data gathered from these sites will be used for validation of the energy and wellbeing performance of digital prediction models. The development of high level of confidence digital twin room models will help provide the tools for evaluation of materials and design solutions to achieve better energy efficiency.

Furthermore, the understanding of the indoor environment dynamics will provide the essential skills and knowledge to develop sensor systems for self-predictive issues within structures for in-situ applications and improve the efficiency in service of the materials incorporated into buildings.

Website link: http://seec.bangor.ac.uk/index.php.en

*Dr Athanasios Dimitriou and his sensors.*

# National and International Funded Projects

## Agri-innovation (POSTCOVA)

The POSTCOVA (Post Covid-19 Agricultural Bioscience Innovation Wales) - was a 12-month research programme to secure post-COVID recovery and development of the agricultural sector in Wales.

The purpose of the programme was to improve the country's food security and provide the potential for rural job security. The focus was on delivering data showing how new technologies could boost farming production efficiency and improve soil carbon reserves, while reducing greenhouse gas emissions (nitrous oxide and carbon dioxide), runoff of nutrients into watercourses and over use/inefficient use of pesticides and fertilisers.

Led by Emerald Research Ltd. (ERL), the project built upon the expertise developed in the EU INTERREG NASPA project. Other industrial partners included Puffin Produce Ltd. (PPL) a leading potato producer in Pembrokeshire and agritech specialist Ymgynghorwyr Lisk & Jones CYF (Lisk & Jones).

POSTCOVA tackled major reductions in use of Nitrogen fertiliser – which, besides bovine methane emissions, is the largest source of $CO_2$ equivalent emissions in agriculture, through Nitrous Oxide emissions and huge energy production costs.

ERL developed an entirely new form of Nitrogen fertiliser, AZOTICA, that is applied directly to crop foliage and never applied to soil. Unlike other Nitrogen products, AZOTICA can be applied at high dose rates to foliage without causing any crop damage, allowing over 90% take-up efficiency and eliminating Nitrous Oxide emissions from added crop fertiliser almost entirely.

The project demonstrated that by using this form of Nitrogen the partners could cut overall applications by 30-50% or more and reduce Greenhouse Gas (GHG) emissions by potentially 90% on a range of vegetable crops. Additionally, use of benign soil microbial mixtures and foliar applied naturally derived biostimulants improved crop growth and rooting while sequestering significantly more carbon directly into the soil.

Furthermore, through POSTCOVA, ERL developed and now has an International Patent Pending on a GHG emissions detector management device intended for use by farmers and advisors – something unavailable until now and a device that could be a game changer for environmental and emissions management.

*POSTCOVA Wheat Field Trial at Bangor Univeristy's research farm.*

# National and International Funded Projects

## Seaweed, a sustainable alternative for single-use plastics

Plastic pollution and the impact it has on our environment is regularly highlighted in the media, significantly affecting our communities, and having a devastating impact on our wildlife.

The BioComposites Centre (BC) is collaborating in the PlantSea-Pack project which is led by biotech start-up PlantSea and backed by Innovate UK. The third collaborator, Olew Limited, is another Welsh SME. The aim of the project is to develop a bioplastic material using seaweed as the primary feedstock.

PlantSea-Pack is aiming to foster packaging re-use, by adopting the concept of a re-usable bottle-for-life. The project will promote the usage of refills of personal care goods (shampoo, conditioner, detergents) and other fluids (cleaning liquids), and support the delivery of Plastic Pact targets.

Dr Viacheslav Tverezovskiy, Head of Chemistry Research at BC explains: "To make the collaboration more effective, PlantSea decided to move its research lab closer to Bangor, and the company has established a new lab in the MSPARC research hub. PlantSea is looking to rapidly commercialise its novel technology in a broad range of applications and access to the BioComposites Centre's expertise in this sector is critical" added Dr Tverezovskiy.

Co-founder of PlantSea, Mr Sanfratello said, "It is very timely to be looking at this kind of technology, because the world is waking up to the problem and there is a lot of funding and support for finding alternatives to plastics, so we saw this as a wonderful opportunity to get started. Consumers are starting to be more eco-conscious and want these solutions, so we are one of many working towards that and we're excited to be able to offer our solution in the future."

*Dr Viacheslav Tverezovskiy and Gianmarco Sanfratello at Plantsea's MSPARC lab.*

*Sean Baxter in the pulp and paper lab evaluating the quality of recycled pulps.*

## Wood fibre used to make 100% plastic free bottles

This year has seen the BioComposites Centre develop a new partnership with Pulpex Ltd, an innovative company based in Cambridgeshire. Pulpex's aim is to manufacture and market a renewable, recyclable and 100% plastic free bottle that is made from wood fibres.

The company has the backing of global brands and is aiming to replace plastic and glass by creating a novel pulp moulding process. To help them deliver this aim Pulpex has teamed up with the BioComposites Centre to provide specialist technical support.

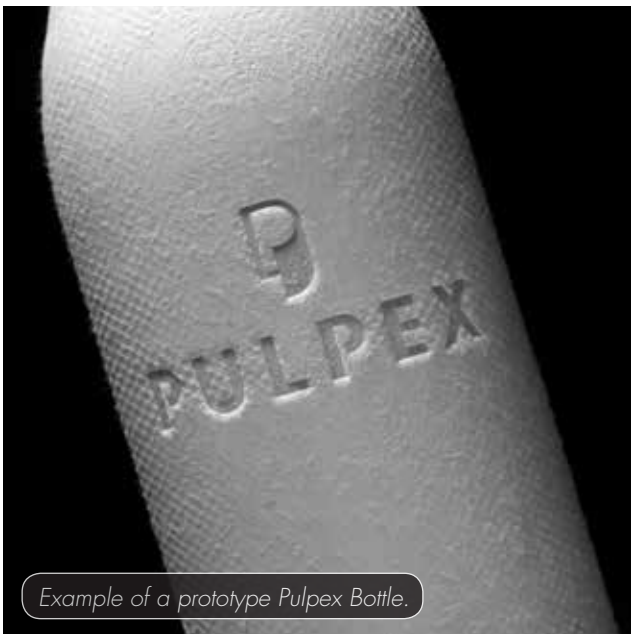
Materials technician Sean Baxter is working alongside Scitech Adhesive Systems in Flint, to test the barrier performance of internal coatings used to make the bottles

# National and International Funded Projects

watertight. "These coatings need to be suitable for various liquids, and to withstand the pressures and temperatures used during manufacture, filling and transportation of the novel bottles" explains Sean.

Working in the BioComposites Centre's pulp and paper laboratory at Mona, Sean is also testing the bottles to ensure that they can be easily recycled at the end of their life. To do this the bottles must pass an industry standard that is used to classify if the ease of recyclability. We can report that the bottles are successfully passing these tests.

Rob Elias, project manager added "It is encouraging to see the commitment made by Pulpex Ltd to the development of a sustainable and easily recycled material. We are pleased that our role as a partner is highlighted on their new website. This really helps recognise what we can offer to companies to develop their technologies!"



*Example of a prototype Pulpex Bottle.*

## Biodegradable mulch film with controlled service life

In 2021 the ZEWAMFI, Newton funded UK-China, project went into its third year. The project is about developing cost competitive, biodegradable agricultural mulch films for arable crops. The team have made considerable progress with formulation development and field trials.

The use of biodegradable mulch films rather than polyethylene (PE) mulch films in agriculture help to avoid the build-up of plastic waste in soils. This happens when


*Field trial set up with biobased mulch films.*

# National and International Funded Projects

PE mulch films are ploughed back into the field after use. Use of biodegradable films means plastic does not enter the soils. However, control of service life and rate of degradation of biodegradable agricultural films is important for their efficient and environmentally friendly use.

The project team have successfully demonstrated that the initial service life and subsequent rate of degradation can be varied in relation to a control film made from the same biodegradable polymer base.

Preliminary trials performed in ZEWAMFI for a period of 70 days proved that the films made from biopolymers can be degraded in soil. The initial results confirmed that the biodegradation of the films in soil will not generate microplastics.

The demonstration trials ran at different locations in the UK and confirmed the degradations of films in the field followed the same trend as the results from laboratory accelerated weather testing and do not generate microplastics.

Through the Publicly Available Specification (PAS) process, new BSi PAS will be developed based on the development work of the project to account for the stability required in service to establish the crop, followed by rapid biotransformation of the material such that it biodegrades in the soil in a timeframe which prevents short-term accumulation of material in the soil.

Project leader, Dr Gary Ogden from Wells Plastics and field trial manager, Sam Maycock from Velcourt are happy with the project progress and keen to exploit the findings further to address UK farming issues with certain crops.

*Sample collection of aged bioplastic films in Fenlands.*

# National and International Funded Projects

## Biowill project now making great progress

The Biowill project faced major delays in 2020 because of the Covid-19 pandemic. But in 2021 the BioComposites Centre received the first batches of willow, grown in Ireland, to be converted into pulp moulded packaging for food applications.

Biowill, is a three-year project funded through the Interreg NW Europe funding scheme. Biowill focuses on using willow as a feedstock, to create a value chain of biobased products including medicines, packaging, biogas, and fertiliser.

Led by the University of Limerick, the Biowill project includes partner organisations in Ireland, France, Belgium, and the UK. The project links key parts of the supply chain together including willow breeders, farmers, technology providers and industrial end–users.

See also the Events section below for other activity related to the Biowill project.


*Dr Adam Charlton explaining the Biowill approach to Minister, Lesley Griffiths MS.*

# National and International Funded Projects

## Bait bag alternative to reduce marine plastic pollution

Marine conservation charity Sea Trust Wales is working with shellfish supplier Macduff Shellfish and Bangor University's BioComposites Centre to prevent a common source of plastic from entering the marine environment.

Plastic bait bags are commonly used in the whelk fishing sector by shellfish fishermen and in seafood processing factories. They are not easily cleaned, or recyclable so often end up in landfill, and they can sometimes fall overboard when used at sea, impacting on marine and coastal wildlife.

This collaborative project seeks to find a sustainable alternative to these woven, plastic bait bags. Researchers are initially examining how the bags are used and exploring how they could be improved. The team aims to develop a robust, commercially viable, biodegradable, bioplastic bag. If successful, it could have wider applications across aquaculture, agriculture, and food processing.

Rob Elias from the BioComposites Centre explained. "An important aspect is ensuring that any alternative bait bag performs better than what it replaces. We know that currently shellfish get caught in the mesh of the bags and are difficult to extract. A key part of the project was working with Sea Trust Wales and the whelk fishermen to find out the issues they face. Knowing the issues that they face we can then look to enhance the usability and sustainability of the bags while retaining the robustness."

Technical work at the BioComposites Centre looked at how existing bait bags could be cleaned and then the material reprocessed into a polymer bag which is more robust and readily recyclable. Dr Qiuyun Liu explains, "The project also looked at alternative biobased materials that could be used in the future. If these materials were to fall accidently into the ocean, they would biodegradable over time, unlike the current conventional materials."

The feasibility project is all about sustainability and measuring sustainability is complex. To help with this task the expertise of LCA specialist Campbell Skinner at the BioComposites Centre was needed. Campbell studied the processes of manufacturing a bag using a Life Cycle Assessment (LCA) approach. Campbell explains "This is a complex process but working to understand the carbon footprint of a product or a process is critical! This understanding can inform the direction of the research steps needed in the future to improve the environmental performance."

This feasibility study was supported by the UK Seafood Innovation Fund. The fund supports innovative projects which aim to bring new ideas and technology to the UK seafood sector, improving long-term productivity and sustainability for the industries across the seafood supply chain.


*Example of take the bait media campaign to reach local fishing communities.*

# National and International Funded Projects

## Foamed Compol™ for chilled fish and seafood packaging

Foamed materials, for example expanded polystyrene (EPS) and foamed polyethylene (PE), offer excellent thermal conductivity and are therefore widely used for packing chilled fish and seafood. However, disposal of such fossil-based plastics poses a pollution risk.

Compol™ is the trade name of a biodegradable polymer developed during the HDTBioPol project with Wells Plastics and launched under this trade name in 2019. The follow on funding from Smart Sustainable Plastic Packaging allowed the BioComposites Centre and Wells to develop Compol™ further for foamed trays. We are delighted to report that Compol™ can be foamed physically or chemically.

*Extruder foamed bioplastics for thermoforming fishbox.*

*Fishbox team, Tom Leech, Rob Elias, Richard Coles and Linda Nicolaides.*

The new Eco-fishboxes (Eco-fB) project funded by Cefas offers the opportunity for the BioComposites Centre and their industrial partners to deliver an eco-friendly solution to replace problematic EPS. Eco-fB pack formats will feature novel 3-D shapes providing fit-for-purpose strength, improve barrier and insulation properties. Eco-fB formats will serve to enhance the sustainability credentials of a new generation of fish/seafood business.

## Stoverpack pack project update

Led by the BioComposites Centre the Stoverpack project was a collaboration between partners in the UK and Uganda. The aim of the project was to develop pulp moulded packaging from maize stover, the residual material remaining after the maize harvest.

Maize stover is often left in the fields or used as fuel. The Stoverpack project aimed to generate additional value for this material, through the production of food packaging. This biobased packaging could be used as an alternative to some single use plastics in Uganda.

The issue of post-harvest losses of fresh produce due to spoilage and inadequate packaging used during transportation between farm and market is a major issue across Africa. Stoverpack was trying to address these issues in Uganda through a series of farmer workshops and training sessions.

Project activities were delayed by the Covid-19 pandemic and Stoverpack was one of three overseas projects in the BioComposites Centre that was negatively impacted by cuts to the Foreign and Commonwealth Development Office overseas aid budget in 2021. Funding for Stoverpack was removed in May and the project finished three months early in August 2021.

Despite the ongoing issues, the project delivered several important outputs:

- Equipment for pre-processing maize stover was designed by the Ugandan partners.
- Four distinct types of moulded pulp packaging were produced at the BioComposites Centre from maize stover.
- Stakeholder engagement activities in Uganda were co-ordinated by Makerere University and used the new packaging developed during the project. Activities

# National and International Funded Projects

included workshops and training events with farmers, market holders and supermarket retailers.

- A preliminary design for a commercial pulping / pulp moulding process, based on using multiple tonnes of maize stover each day was produced.

Stoverpack was an 18-month feasibility study project funded by Innovate UK and Department for International Development (now the Foreign and Commonwealth Development Office-FCDO), through the AgriTech Catalyst programme.

*Chief engineer Llion Williams with samples of packaging made from stover.*

A final stakeholder/investor workshop to secure follow-on funding was cancelled due to the early termination of the project. However, the partners hope that additional funding will be found to show the full potential of this approach to adding financial and environmental benefits to a 'waste' biobased material.

## Carbon calculator helps customers make informed choices

The LCA team at the BioComposites Centre have produced a carbon calculator for one of the UK's biggest timber and materials supplier, James Latham.

This calculator takes data compiled for a range of timber products and produces a total carbon figure for any order placed. Each product had their carbon footprint calculated on a 'cradle-to-warehouse gate' basis which captures GHG emissions up to the point of sale. It also reports the biogenic carbon of the product (the $CO_2$ that has been removed from the atmosphere during photosynthesis and stored within the products structure).

The calculator uses environmental impact data from lifecycle inventory databases and manufacturers independently verified EPDs (Environmental Product Declarations) where available.

Uniquely, the carbon footprints are assigned a confidence score (C1–C4) indicating the degree of confidence with which the results are reported. A score of C1 indicates the highest level of confidence and is reserved for footprints based on supplier EPDs. This can be seen as a gold standard in terms of manufacturer transparency with respect to their carbon emissions.

It is hoped that this innovative carbon confidence scoring system, which is visible to customers as a confidence label on their receipts, will drive more manufacturers to embark on LCA analysis and to publish their results via EPDs. This will drive better public awareness of the benefits of using wood-based products as carbon-efficient materials and will enable comparisons to be made between the products listed.

https://www.lathamtimber.co.uk/carbon-calculator-

*Campbell Skinner and George Roberts and wood based panels.*

# National and International Funded Projects

## Laserwood - the project with immediate commercial potential

The Innovate UK funded Laserwood project provided an intense nine-month focus on further developing a laser incision rig, which had been an output of the successful LaserCure project.

The same consortium of companies and universities were assembled and completed the work despite loss of one partner company mid-way through the project. The main developments were robust testing of plank scale pieces for full scale treatment with liquids; development of novel incision patterns to better harness the flow pathways within the wood; enhancing the machine to handle a wider range of timber dimensions; enhancing throughput (feed rate) and extending the range of timber species and efficient distribution of fluid throughout the wood.

While other systems, such as mechanical incision, are better advanced within the market, the laser system offers key benefits in terms of aesthetics and precision. The project has allowed a greater range of thicknesses of timber to be incised, and bespoke incision patterns to be developed to cover the needs of a wider customer base – from fence-post treatments through to joinery applications.

This is an exciting project output with immediate commercial potential. The team hope to engage clients from across the timber treatment industries in a series of events during 2022.

*Incised wood samples ready for testing.*

# Awards

## Home-Grown Homes project wins three awards

A pioneering council-led project, designed to encourage greater use of Welsh timber in the construction industry, has won three prestigious awards.

Ceri Loxton has been on secondment from the BioComposites Centre to Woodknowledge Wales (WKW), who delivered the Home-Grown Homes project for Powys County Council, for the past three years. The Welsh Government funded project was launched to identify and test interventions that could have a transformative impact on the Welsh timber construction supply chain and on the delivery of low carbon social housing in Wales.

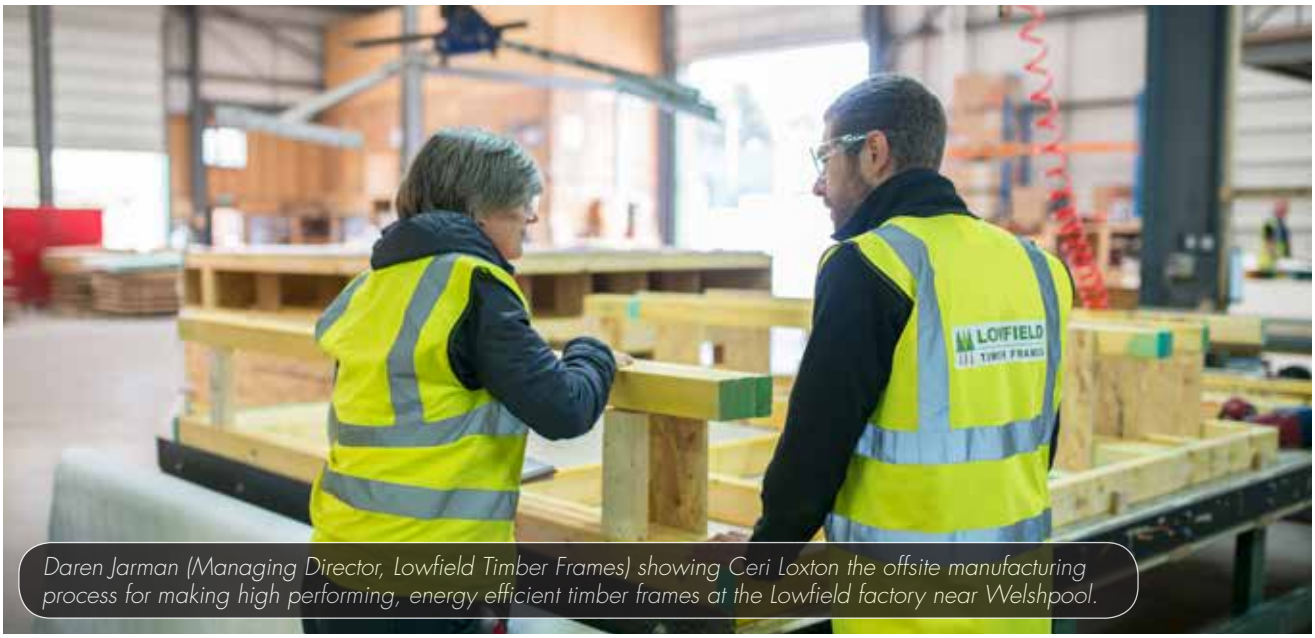
The project, which formally finished in 2021, has so far picked up the following awards: Innovation and Value award for the project from Constructing Excellence in Wales (CEW) 2021 with Woodknowledge Wales also being highly commended in the SME of the year category. At the Social Value for Future Generations Awards 2021 the project won the Public Leadership Award.

"It's been a fantastic experience to be part of the Woodknowledge Wales team during the Home-Grown Homes project and very satisfying to see the teams' efforts acknowledged by winning these awards," said Ceri.

Gary Newman, chief executive of Woodknowledge Wales said: "I'm delighted that the Home-Grown Homes Project has picked up these awards. This project has enjoyed successful collaborations across the supply chain, and it has enabled WKW to build on relationships with both the BioComposites Centre and the forestry group at Bangor University."

"Bangor University are in a unique position in the UK to help with the transition to a sustainable forest sector. WKW

believes that this is required to help Welsh Government deliver on its net-zero carbon targets." Gary went on to say that as WKW go forward and seek funding for a follow-on project they hope to work more closely with Bangor University over several different projects.




*Daren Jarman (Managing Director, Lowfield Timber Frames) showing Ceri Loxton the offsite manufacturing process for making high performing, energy efficient timber frames at the Lowfield factory near Welshpool.*

## University Putra Malaysia (UPM) and Bangor scoop silver award for SafeBioPack project

The Sustainable Development Goals International Innovation Awards for 2021 were hosted at The Malaysia Technology Expo on the 25-29th of October 2021.

The awards welcomed 206 submissions and 176 entries were shortlisted from Malaysia, Indonesia, Hong Kong, Taiwan, Thailand, Bangladesh, United Arab Emirates and Yemen.

The awards are designed to encourage the development of local solutions to local challenges, and they recognise the importance of research projects that help to achieve the United Nations Sustainable Development Goals (SDGs).

The joint project between the BioComposites Centre, Bangor University and UPM looked at the development of novel packaging materials utilising waste co-products generated by the oil palm industry. Sponsored by Innovate UK, The Newton Fund and co-funded by The Malaysian Industry-Government Group for High Technology (MIGHT) the SafeBioPack project successfully developed a range of new packaging materials that were prototyped by the industrial partners in Malaysia and the UK.

The silver award was made in the Environment and Natural Resource Category. It recognised the efforts of the joint UPM/Bangor team in development of biobased materials for food packaging applications. UK project manager Dr Qiuyun Liu explained, "Getting the award really helps recognise that this project was an effective team effort, we really enjoyed the collaboration with Prof Jawaid's team in UPM." Dr Liu went on to add, "We hope to develop a new project in the future that will continue to help support the SDG s of the United Nations."

*Making prototype trays from waste fibres at Mona.*

# Other Activity

## Welsh Government Minister visit to Mona pilot plant

Lesley Griffiths MS visited the BioComposites Centre pilot plant at Mona, Anglesey in December 2021 to learn more about the Biowill project. The Minister was shown how willow can be used to create a range of biobased products including medicines, packaging, and biogas, using a circular economy approach.

The Minister confirmed added funding support for the Biowill project as part of this visit. A strategic priority for Welsh Government is strengthening the links between Ireland and Wales. The aim of the visit was to highlight Biowill as an excellent example of collaborative research which is building partnerships between the two countries and research groups in Northern Ireland, Belgium, and France.

(https://www.bangor.ac.uk/news/minister-visits-bangor-universitys-biocomposites-centre-and-m-sparc-science-park-to-learn-more)

*From Left to Right Minister Lesley Griffiths, Rob Elias, Adam Charlton and Bangor VC Prof Iwan Davies visit Mona.*

## Problems with spray foam insulation in buildings

In 2021 Dr Simon Curling, along with other experts was invited to join a Technical Working Group to review the latest research and best practice for applying sprayed foam insulation in roofs.

The increased use of sprayed polyurethane (PU) foams as insulation in domestic properties has been the cause of considerable debate within the property care industry for a few years.

The BioComposites Centre has a history of engaging with several varied organisations within the building, construction and building care sector. In 2021 the Property Care Association (PCA) and the Residential Property Surveyors Association (RPSA) convened a group of technical and industry stakeholders to consider the effects of sprayed foam insulation products applied to existing domestic roofs.

Surveyors and valuers have found it difficult to report on the condition of a roof that has had spray foam insulation applied to its underside. In some cases, this has led to refusing to offer loans on affected properties. This, in turn causes issues for the homeowner as it may affect the saleability or equity release from their property.

As a result of the review the PCA and RPSA has released a statement that says, "It is unlikely that a surveyor undertaking a valuation, or a condition survey will be able to provide any advice relating to the condition or life expectancy of the roof structure where the installation of PU foam is not supported by detailed technical information." Without such detailed information the surveyor may have to use caution and recommend early replacement of the roof.

A joint information paper and position statement have been issued and these are available on the Property Care Association website (https://www.property-care.org/professionals/sprayed-foam-insulation/)

PCA Property Care ASSOCIATION

RPSA RESIDENTIAL PROPERTY SURVEYORS ASSOCIATION


*Technically Speaking on Modified Wood Panels.*

## Spreading the word

Staff from the BioComposites Centre (BC) continue to write articles for the Technically Speaking column in Wood Based Panels International (WBPI). This bi-monthly publication is the trade magazine for the wood panels sector.

The BC team took on the column when Dr Mark Irle of Ecole Superieur du Bois stepped aside in June 2018. Since that time, we have produced over twenty articles on a wide range of topics.

During 2021 the topics covered included: decarbonising in the WBP sector, density profiling, densification as a wood modification technique, the many strengths of wood-based panels and the future of wood modification in the panels sector.

# Conferences and Events

## Biowill dissemination events for Welsh Government

In Autumn 2021, Welsh Government approached the BioComposites Centre, Bangor University, to organise a webinar on the Biowill project for the benefit of external stakeholders.

Welsh Government is supplying added funding support for the project and is keen to see that the potential impact of the project is communicated to a wide range of interested stakeholders including farmers, businesses, academia, and the public sector.

The webinar took place in November 2021 as part of a series of events linked to Wales Climate Week and was hosted by Environment Platform Wales. The webinar consisted of a series of short presentations from different Biowill partners. Presentations covered key parts of the supply chain including willow breeding, medical applications, packaging, energy production and Life Cycle Assessment.

(https://epwales.org.uk/events/biowill-webinar-development-of-an-integrated-net-zero-bio-refinery/)

*The Biowill team at Mona- Adam Charlton, Jacob Williams and Jon Nicholls.*

## BEACON project restarts networking events post lockdown

*BEACON Business Development Managers Selwyn Owen and John Davies (L-R).*

The focus of the BEACON project is working with companies in the West of Wales. However, the BEACON East project has allowed the team to work with businesses in the Eastern industrial regions of Wales such as Deeside, a significant location for many innovative Welsh businesses.

The BEACON Business Development team attended and exhibited at the North Wales Business Exhibition held on the 27th of October at Coleg Cambria, in Connah's Quay.

The event was organised by the Deeside Business Forum in collaboration with Flintshire local authority and the theme for the day was "Business is the New Reality."

This was the first live event attended by the BEACON team since the start of the pandemic.

Helping to increase R&D activity in Wales is a key aim of the BEACON project so an opportunity to meet and talk with businesses was warmly welcomed by the Beacon Business Development Managers (BDM) Selwyn Owen and John Davies.

The event was also an opportunity to rebrand the BEACON message. BEACON literature was refreshed with a decarbonisation theme and the team were on hand to meet and explain how the BEACON project could help companies meet their future zero carbon targets.

Selwyn Owen BEACON BDM explained, "It is great to be out on the road again and attending these events provides a unique opportunity to meet some 100+ exhibitors that are showcasing their businesses, where we can offer innovation advice and expand our networking." BEACON Deputy Director Rob Elias added, "A key starting point in developing new collaborations is meeting people, so it was great to be at the event, supporting the BDMs and meeting new contacts."

After this success, the team will be planning further events in the Deeside and Wrexham areas.

# Conferences and Events

## Wood Science and Engineering Conference

Two of the BioComposites team went to the Wood Science and Engineering conference in Kaunas, Lithuania in November 2021.

Our PhD student Carlo Kupfernagel was able to attend a pre-conference workshop for postgrad students from across Northern Europe. This is an important benefit of collaborating within the Northern European Network for Wood Science and Engineering; the chance to interact and share knowledge amongst emerging researchers in this field. The group of students were shown various laboratory techniques and had sessions looking at adhesives. Carlo also presented work from his thesis, addressing the suitability of various species of hardwood timbers for wood modification with a phenolic resin.

Dr Morwenna Spear also attended the event and presented the outcomes of the LaserWood project. This project has made great progress in development of a scale up prototype laser incision machine for timber. It also considered the influence of wood density, growth rings and wood anatomy on targeting the laser incision hole patterns for different wood species of commercial interest. The rig is suitable for incising timber for many applications, including wood modification and timber protection with preservatives or fire retardants.


*Wood Science and Engineering conference in Kaunas, Lithuania in November 2021.*

# People

## Judith Burgess

I returned to the BioComposites Centre in December 2021 as I needed a challenge and I have certainly not been disappointed. Working both in industry and academia has provided a wealth of knowledge, networking opportunities and good working relationships in both fields which is a necessity for BC. My leading role is financial management within the department, working with stakeholders across numerous projects and frequently undertaking the many other duties required within a busy department.

## Jacob Williams

I achieved my BEng (Hons) in Aeronautical and mechanical from Glyndwr University in 2016, since then I have worked as a contract engineer on a variety of diverse projects from the building of the M8 motorway to the fabrication of steel art sculptures. I previously worked at Bangor University in the estates and facilities department in 2012 as a student engineer and 2016 as a graduate engineer

I joined the BioComposites Centre in 2021 as Process and Maintenance Engineer working at our pilot-scale facility at Mona on Anglesey. I have learnt to operate and manage all the plants' processing machinery. I work closely with the Centre's industrial and academic project partners on a wide variety of projects.

*Jacob Williams.*

# Publications & Publicity

Aziman, N., **Jawaid, M**., Mutalib, N. A. A., Yusof, N. L., Nadrah, A. H., Nazatul, U. K., **Tverezovskiy, S., Tverezovskaya, O**., Fouad, H., **Braganca, R., Baker, P**., Selbie, S. & Ali, A. (2021) Antimicrobial Potential of Plastic Films Incorporated with Sage Extract on Chicken Meat. *Foods*. 10, (**11**), 2812.

Baltazar, M., Correira, S., Guinan, K. J., Sujeeth, N., **Braganca, R.** & Goncalves, B (2021) Recent Advances in the Molecular Effects of Biostimulants in Plants: An Overview. *Biomolecules*. 11, (**8**), 34439763

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Qi, R., Jones, D. L., **Liu, Q**., Liu, Q., Li, Z. & Yan, C. (2021) Field test on the biodegradation of poly (butylene adipate-co-terephthalate) based mulch films in soil. Jan 2021, *Polymer Testing*. 93, 107009.

Sandak, A., Sandak, J., Noel, M. & **Dimitriou, A**. (2021) A Method for Accelerated Natural Weathering of Wood Subsurface and Its Multilevel Characterization. *Coatings*. 11, (**2**), 126 19 p.

**Spear M.J, Curling S.F., Dimitriou A, Ormondroyd G.A.** (2021) Review of Functional Treatments for Modified Wood. *Coatings* 11 (**3**), 327

**Spear M.J**., Hill C.A.S. and Price C. (2021) A conceptual methodology for estimating stored sequestered carbon in the built environment. Chapter 32 in: *Smart Innovation, Systems and Technologies, Vol 23, Sustainability and Energy in Buildings 2020*, Littlewood et al. (Eds.), p381-393. ISBN 978-981-15-8782-5 DOI: 10.1007/978-981-15-8783-2_32

**Spear M**., Mason P., Williams G., **Miles C**., **Williams E**., Pitman A., Bailey R., Theobald T., Nath S., Waugh D., **Ormondroyd G**. (2021) Demonstrating the Suitability of Laser Incision for Timber Treatment Technologies. In: *Proceedings of WSE 2021*, Northern European Network of Wood Science and Engineering, 14-15th October 2021, Kaunas, Lithuania. p. 101-103

# Publications & Publicity

Višnjevec A., **Baker P., Charlton A., Preskett D.**, Peeters K., Tavzes C., Kramberger K and Schwarzkopf M. Developing an olive biorefinery in Slovenia: (2021) Analysis of phenolic compounds found in olive mill pomace and waste water; *Molecules* 2021, 26, 7. https://dx.doi.org/10.3390/molecules2601000

Višnjevec A Miklavčič, **Baker P., Charlton A., Preskett D.**, Peeters K. (2021) Developing an Olive Biorefinery in Slovenia: Analysis of Phenolic Compounds Found in Olive Mill Pomace and Wastewater. *Molecules* 26 (**1**), 7

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Ward R.A., **Charlton A.**, Welham K.J., **Baker P.**, Zein S.H., Tomkinson J., Richards D., Kelly S.M., Lawrence N. S. and Wadhawan J.D. (2021) Electrochemical Quantification of D-Glucose during the Scalable Production of Bioethanol from Thermo-Mechanically Refined Wheat Straw; *Electrochemistry Letters*, 124, 106942. https://doi.org/10.1016/j.elecom.2021.106942

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# Staff List

## BioComposites Centre
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| | Graham Ormondroyd |
| | Morwenna Spear |
| | Olga Tverezovskaya |
| | Paul Baker |
| | Qiuyun Liu |
| | Radak Braganca |
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| **Administration and Finance** | Judith Burgess |
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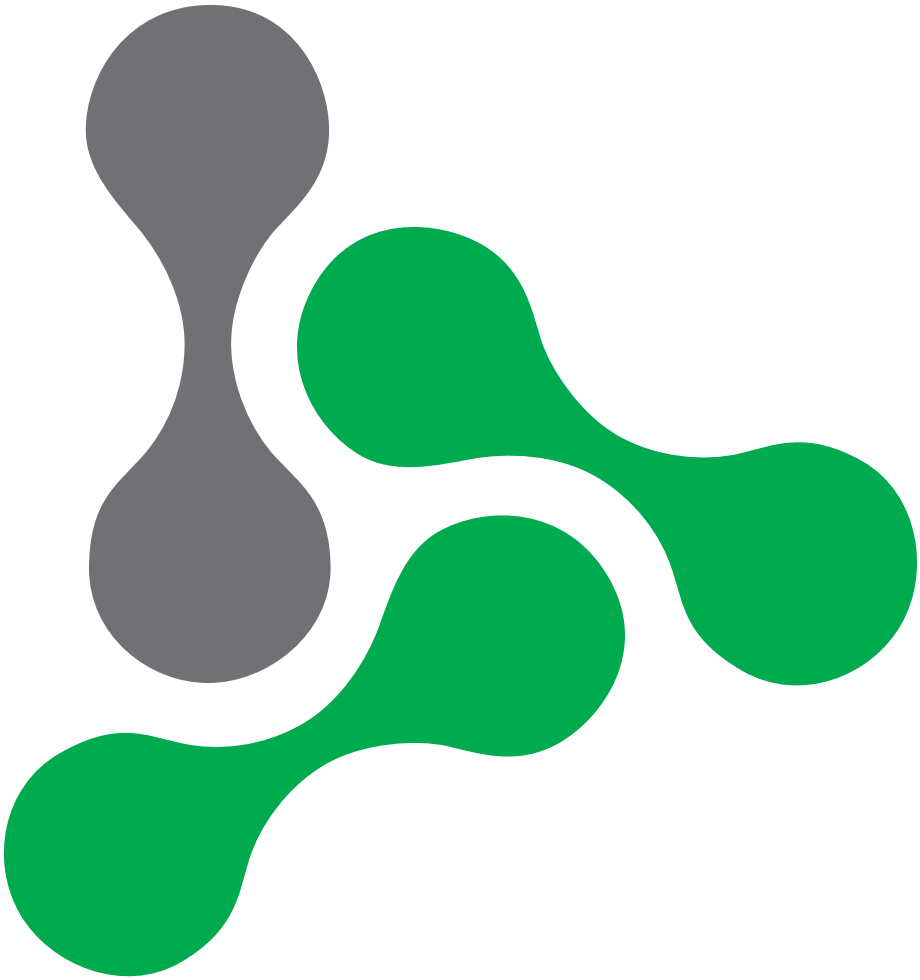
| **Student** | Carlo Kupfernagel |



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