The BioComposites Centre (BC) was established in 1989, is self-financing and undertakes collaborative research projects to develop sustainable, bio-based technologies and products that will minimise the impact on the environment. BC collaborates with companies across a wide range of industry sectors including forestry/agriculture; construction and packaging; cosmetics and functional foods and polymers/coatings. BC works with large multinationals, SMEs, micro companies and research institutes in the fields of materials science, green chemistry, bio-refining and sustainability assessment. We have worked collaboratively with many partners over the years and have a proven track record in delivering projects successfully.

The BioComposites Centre’s BEACON capability, based at Bangor University, is located on two sites: the main Bangor University science campus and the Biorefining-Technology Transfer Centre based at Mona on Anglesey.

These facilities house a range of key equipment and associated expertise to enable academic and industrial partners to develop and demonstrate scale-up processes, taking laboratory research through to industrial applications.

The School of Environment, Natural Resources and Geography has a world-class reputation in research, with particular expertise in forest ecology and management; environmental studies and soil science; agricultural systems; agroforestry; biodiversity conservation; and tropical ecosystems. The School’s research mission is to provide a scientific basis for sustainable agriculture, forestry and conservation of natural resources. The BEACON project has access to specific expertise in Mycorrhizal fungi and molecular methods for identification, fungal polysaccharides and their uses and biochemical mechanisms of wood decay.
Aims

- To develop a range of biomass conversion technologies from proof of concept through to early stage demonstration at Technology Readiness Levels of 3-5
- To bridge the gap between laboratory and commercial scale and deliver an impact to industry through collaborative research and development
- To generate a range of products from biomass, including composite materials for construction applications; lightweight packaging produced from both plant fibre and biopolymers for the food and medical sectors and speciality chemicals for the cosmetics, food and pharmaceutical industry
- To develop low carbon processes, technologies and products from which provide alternatives to products made from oil, delivering a positive impact on climate change
- To develop a growing network of industrial collaborators and encourage academia to business and business to business research and technical development
- To generate and exploit intellectual property in collaboration with our partners
- To provide life cycle assessment support to better understand the most environmentally sustainable routes to new and existing products

Core Skills

- Biomass pre-treatment, biocomposites and bioreins for applications in construction
- Plant extracts for food, personal/healthcare applications
- Bioprocessing/extraction of renewable natural materials using conventional solvents and liquid/supercritical carbon dioxide
- Plant fibres and bioplastics for packaging applications
- Formulation, blending and evaluation of biobased plastics
- Plant biomass deconstruction and transformation using fungi and fungal enzymes
- Identification and assessment of fungi for specific deconstruction and biotransformation processes
- Energy monitoring of pilot scale equipment to provide data for Life Cycle Assessments and to help identify and mitigate the effects of biomass processing ‘bottlenecks’

Pilot Scale Equipment:

Biomass pre-processing

- Pressurised disc refiner, coupled to an in-feed hopper/MSD (modular screw device) with a 60 litre digester and flash drier/cyclone system for fibre recovery
- Atmospheric disc refiner
- 35 litre batch ultrasound processing cell
- Hammer mill, forage chopper and additional knife/disc/roller milling and sieving equipment
- Small pilot screw press

Biomass conversion

- Wet biomass fractionation line consisting of 2 x150 litres jacketed tanks, linked to decanter/separator units, ultrafiltration and pilot scale spray drying
- Biocomposites production line consisting of forming station, prepress and hotpress for the production of boards (MDF, OSB etc) at a range of thicknesses
- Pulp moulding/thermoforming equipment for the production of plant fibre packaging
- Twin screw extruder and pelletiser for wood fibre and polymer composites
- Sheet and film casting line/pulp and paper section including handsheet production and testing

Biomass deconstruction

- Large and small scale sterilisation facilities for plant biomass
- Various scale (walk-in, bench-top) controlled temperature / humidity microbiological incubation facilities
- Sterile handling facilities for up to category II microorganisms
- Automated fibre analysis facilities
- Vibrating sample mill
- Luminometer and fluorescence microreaders
- Access to humidified mushroom fruiting facilities
- Facilities for identification of fungi suitable for specific processes (genomic and cultural approaches)

Biomass extraction

- 2x 50 litres stirred glass jacketed reactors and Accelerated Solvent Extraction equipment
- Laboratory and pilot scale liquid/supercritical CO2 extraction equipment
- Liquid-liquid separation up to 10 litres
- Vacuum filtration up to 20 litres and rotary evaporator for 20 litre batch processing

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