LIBRE

Lignin based carbon fibres for composites

http://www.libre2020.eu

Type of Action: Research & Innovation Action

Value Chain: VC1 – lignocellulose

Start date: 01 November 2016

End date: 31 October 2020

BBI JU contribution: € 4,566,560

Summary

The global carbon fibre based composites market is worth an estimated €25 bn. However, using fossil resources to produce the main precursor for carbon fibre, polyacrylonitrile, has limited production capability and high costs. In addition, it depends on finite resources. This means that the development of an alternative source of polyacrylonitrile, using innovative and novel bio-industrial feedstocks and processes, has huge potential to deliver an economic win-win.

The LIBRE project will utilise lignin-rich side stream feedstock from the pulp and paper industry, blended with a biopolymer precursor fibre, to create a more resource-efficient and sustainable carbon fibre production process.

The ultimate aim of the LIBRE project is to create carbon fibre materials with a superior structure that will open up potential new markets.

Objectives

- Use lignin rich side streams in order to develop a more resource-efficient and sustainable carbon fibre (CF) production, based on biopolymers for precursor fibre (PF) production and energy efficient processing technologies for conversion of PF to CF which will have performance levels matching or improving current industrial standards.
- Replace polyacrylonitrile (PAN) PF with a PF made from sustainable bio-sources, specifically lignin (a waste product of the papermaking industry), blended with biopolymers.
- Develop an innovative lower energy conversion process of PF to CF than that currently used by industry, which uses ovens and furnaces, by utilising microwave/radio frequency (MW/RF) technologies, in conjunction with novel non-metallic MW/RF subsectors incorporated into the PF.
- Replace both the wet electrolytic process currently used by industry to modify CF surface chemistry, which plays a key role in

Expected impacts

- Development of new bio-based composite materials utilising lignin from the pulp and paper industry blended with biopolymers as a precursor.
- Reductions in energy consumption and greenhouse gas emissions during the manufacturing process through the use of microwave and radio frequency (MW/RF) heating technologies.
- Surface functionalisation using non-aqueous processes to enhance performance in polymer composites.
- Increased sustainability of composite materials.
- A competitive edge for end-user sectors such as transportation, renewable energy and construction.

Consortium

- University of Limerick (Ireland)
- C-Tech Innovation Ltd (United Kingdom)
- University of Bolton (United Kingdom)
- TECNARO GmbH (Germany)
- Fraunhofer-Gesellschaft zur Foerderung der angewandten Forschung e.V. (Germany)
- Institute for Composite Materials (Germany)
- Chalmers Tekniska Hoegskola (Chalmers University of Technology) (Sweden)
- Centro Ricerche Fiat S.C.p.A. (Italy)
- Centexbel (Belgium)
- German Institutes for Textile and Fibre Research Denkendorf (DITF) (Germany)
- ÉireComposites Teoranta (Ireland)
- Dralon GmbH (Germany)

determining composite properties, and the aqueous sizing process which enables fibre handling by mechanical processes, with a single robust, low energy and pollution-free atmospheric pressure plasma process. Incorporate novel ideas into the physical and chemical modification of lignin such that composites based on this waste stream precursor material will have properties and processability which are tailored for the needs of CF production.

Project coordination

Organisation name: University of Limerick