

Functionalised Innovative Carbon Fibres and Nanofibers: Novel Precursors with Cost Efficiency and Tailored Properties

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Carbon fibers (CFs) and nanofibers (CNFs) tend to be applied in numerous technological applications, replacing conventional materials (e.g. steel), in forms of composites. Considering their design, various parameters need to be considered. Polymer precursors, such as polyacrylonitrile (PAN), lignin, rayon, polyolefin and pitch, are to be selected for carbon fiber production; polymer precursor as raw material has first to be converted into fiber. In recent years, biopolymers have moved into the focus of interest as precursor for carbon fibers because of their high carbon content and high carbon yields providing at low costs. Among biopolymers, lignin is a promising carbon precursor because it contains a large amount of aromatic groups. It could be characterized as a sustainable resource material, the cost of which is largely independent of oil prices comparatively to state-of-the-art known precursors (e.g. PAN). Lignin is one of the main components in the wood, which gives stiffness to the cell wall and, therefore contributes to the material's mechanical properties.

In this work, potential precursors are investigated as raw materials, while carbon fibers and nanofibers are treated (e.g. plasma treatment) in order to meet the industrial needs of high technology/ small scale and low technology/large scale applications, namely supercapacitors and security shelters.

Acknowledgments

This work is supported by FP7 Collaborative project "FIBRALSPEC"- "Functionalised Innovative Carbon Fibres Developed from Novel Precursors With Cost Efficiency and Tailored Properties" (Grant agreement no.: 604248).