SUCCESS STORY

Wood K plus
WOOD: next generation materials and processes – from fundamentals to implementations

Programme: COMET – Competence Centers for Excellent Technologies

Programme line: COMET-Center (K1)

Type of project: Biocarb-K, 2015-2021, strateg., IWB2014-2020, EFRE

BIOBASED CARBON MATERIALS AND CERAMICS (BIOCARB-K)

IN THE RESEARCH PROJECT "BIOCARB-K", FUNDAMENTALS FOR BIOBASED CARBON MATERIALS AS WELL AS FOR THE MODIFICATION AND CHARACTERISATION OF CARBON SURFACES WERE DEVELOPED. AFTER 6 YEARS, THE PROJECT WAS SUCCESSFULLY COMPLETED IN 2021.

Wood K plus conducted research on biobased carbon materials within a 6-year fundamental project. Research was carried out in five work packages on carbon fibers, activated carbons, shaped carbon bodies and new methods for modification and characterisation:

- WP1: Carbon fibers based on lignin
- WP2: Carbon fibers based on cellulose
- WP3: Porous carbons and fiber composites
- WP4: Biobased ceramic composites
- WP5: Functionalisation and characterisation

A large amount of equipment was purchased for the innovative project and put into operation at Wood K plus in Linz. These include, for example, a melt spinning plant for the production of lignin fibers or three tube furnaces for carbon fiber production - a unique selling point in Austria.

Lignin has great potential as a sustainable and cost-effective precursor material for carbon fibers. However, lignin must be converted into fiber form for this purpose. By developing novel lignin mixtures and stabilisation methods, lignin fibers could be spun and successfully converted to carbon fibers.

Carbon fibers were also produced from biobased cellulose or cellulose/lignin fibers. The yields and strengths were above those of comparable studies

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and show potential that biobased carbon fibers can replace less sustainable commercial fiber types. The produced carbon fibers have already been used for 100% biobased continuous fiber reinforced filaments for 3D printing applications.

© UAR, Photo by: Hartwig Zögl: Wood K plus employees at the tube furnace during the production of carbon fibers from cellulose

Particularly promising results were obtained for porous carbon materials. Biobased activated carbon fibers with surface areas up to 3200 m²/g could be developed. These were successfully used as electrodes in energy storage devices, but also showed great potential as wastewater filters, e.g. for glyphosate removal. The research on biobased SiC ceramics could be patented.

Impact and effects

In the project, new processes were established at Wood K plus in Linz and strategic research fields were developed. Based on the results, three new industrial partners have already been won for projects in the ongoing COMET center. In addition, a research project on biobased carbon semi-finished products for high-performance materials was launched with another new partner in the "Production of the Future" funding programme. Numerous other project applications were submitted. For the reserach on highly porous carbon shaped bodies, Wood K plus was awarded the Upper Austrian State Prize for Innovation 2019. In addition, the numerous scientific publications, including 29 articles in peer-reviewed journals and 38 presentations at conferences, attest to the quality of the research results.

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