Sächsisches Textilforschungsinstitut e.V.

Affiliated institute of the University of Technology Chemnitz

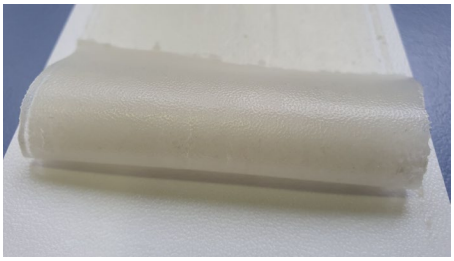
Managing Director: Dr. Heike Illing-Günther
Annaberger Straße 240 | 09125 Chemnitz | Germany | Phone: +49 371 5274-0 | Email: stfi@stfi.de | www.stfi.de

CoaBacCell – Pastes and inks based on bacterial cellulose for the functionalization of technical textiles

Objective

The goal of this project was to develop both a manufacturing process and formulations for functional coating and printing pastes based on cellulose fibres produced by bacteria for use on textiles. The focus was on developing specific formulations for two application scenarios: Protection/decoration and Conductivity/sensor surfaces and structures.

Approach and results



Film formation with BNC formulations

At the start of the project, formulations for coatings based on bacterial nanocellulose were developed. The nanocellulose was supplied as a network of ultrafine fibres in form of mats and, after break-up, it was homogeneously incorporated into various binder materials. Using a variety of components, the development of a modular system for coating formulations was initiated and supported by initial examples. This system formed the basis for the production of pastes and inks made from bacterial cellulose, which were tailored to the respective end application and functionalized in various ways. With project progress, the work focused on breaking the cellulose so that it could be properly incorporated into the various formulations as a structuring component. In addition to cutting using a knife and subsequent processing with an Ultra-Turrax, the research also focused on grinding and homogenization using a planetary mill. The cellulose fractions ground to different degrees were then tested in the previously developed coating formulations.

Because the strong internal cohesion of the cellulose networks increasingly led to agglomeration, particularly at higher mass concentrations of nanocellulose in the formulations, continuous material deposition via 3D printing or spray application became significantly more difficult. For this reason, subsequent application tests focused primarily on knife coating (Figure). Processing the cellulose-containing formulations remained a challenge. Finally, in contrast to the conductivity/sensor application scenario, functional coatings were successfully developed for the protection/decoration application. In all cases, however, further development work is needed with regard to both processing the formulations and the functionality that can be achieved.

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Contact: Dipl.-Ing. Marco Sallat, Phone: +49 371 5274-167, Email: marco.sallat@stfi.de
Dr. rer. nat. Ralf Lungwitz, Phone: +49 371 5274-248, Email: ralf.lungwitz@stfi.de