

Press release

December 15, 2021

Functionalized nanocelluloses for biomedical applications

On December 3, 2021, Bastien Michel defended a doctoral thesis from the Université Grenoble Alpes prepared under the supervision of the Professor Alain Dufresne and Julien Bras, Associate Professor HDR (Grenoble INP-Pagora / LGP2), and the co-supervision of Professor Kristin Syverud (NTNU*, Norway) and of Ellinor B. Heggset, Researcher (RISE PFI**, Norway). He presented the results of his research entitled *Cyclodextrin-functionalized nanocelluloses for biomedical applications*.

Combining oxidized cellulose nanofibrils (toCNF) and various β -cyclodextrin (β -CD) derivatives makes it possible to design high-performance materials for biomedical applications. Although promising, this combination faces certain challenges, in particular the characterization of this toCNF / β -CD association. This thesis therefore consists in characterizing the phenomena of adsorption between toCNF and β -CD in order to improve the release of active ingredients which are poorly soluble in water and, consequently, to promote the antimicrobial properties of these materials.

First, the production of toCNF / β -CD materials was reported, with an investigation on the impact of various process parameters on water sorption and mechanical properties. The adsorption of β -CD was characterized via different experimental tools: it was shown that β -CD derivatives adsorb up to 10 times more onto toCNF than β -CD. The formation of an inclusion complex between a model active ingredient and the various β -CD has been characterized in depth. Finally, the functionalization of toCNF with β -CD showed improvement of the antimicrobial properties of films with increased efficiency for carboxymethylated- β -CD.

By improving knowledge of the interactions between nanocellulosic materials and different cyclodextrins, the results of this project constitute a significant step towards applications in various fields: biomedical, pollution control, etc.

* Norwegian University of Science and Technology

** RISE PFI, Trondheim, Norway, is part of the Research Institutes of Sweden (RISE), in the Bioeconomy division

Contacts

alain.dufresne@grenoble-inp.fr ▪ julien.bras@grenoble-inp.fr

Logo

logo-lgp2.eps