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PRESS RELEASE
20 March 2019

Functionalized cellulose nanofibrils for biobased medical devices

February 11th 2019, Hippolyte Durand defended his doctoral thesis of the University Grenoble Alpes, prepared under the direction of Julien Bras, Associate Professor HDR, and Naceur Belgacem, Professor (Grenoble INP-Pagora / LGP2) and co-supervised by Elisa Zeno, Engineer (CTP). He presented the results of his research work entitled *Functionalization of cellulose nanofibrils for the development of biobased medical devices*.

In line with the ever-increasing academic and industrial interest for wood derived nanocellulose, the present work investigates the chemical surface modification of cellulose nanofibrils (CNFs) for biomedical application.

Drugs and prodrugs of active principle ingredients (APIs) were covalently immobilized or adsorbed onto CNFs films or suspensions. For covalent immobilization, the first strategy selected calls for water-based and single step esterification of CNF films. The resulting materials demonstrated antibacterial activity against both gram-positive and gram-negative bacterial strains, with a prolonged contact-active effect.
In the second strategy, CNFs suspensions were modified through a multistep reaction, involving amidation and click chemistry, still water-based. Highly innovative characterization tools, such as dynamic nuclear polarization (DNP) enhanced nuclear magnetic resonance (NMR), complemented well-established techniques to confirm the success of grafting.

In parallel to covalent immobilization, an adsorption strategy was also adopted, on both CNFs films and suspensions. Then, the CNF films with grafted or adsorbed APIs were used for preparing 100% CNF membrane for potential topical applications. Another component of

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this work used CNF suspensions with grafted or adsorbed APIs that were embedded in collagen matrices to prepare composites for designing soft tissue repair implants. Antibacterial activity against both aerobic and anaerobic bacteria, together with controlled release properties were assessed confirming that such composites present the expected active properties, and can be used for the design of innovative medical devices.

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