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Stimuli-responsive cellulose nanocrystals hydrogels for smart applications



December 1st, 2017, Erwan Gicquel defended his doctoral thesis at University Grenoble Alpes prepared under the supervision of Julien Bras, Associate Professor HDR, and of Céline Martin, Associate Professor (Grenoble INP-Pagora / LGP2). He presented the results of his research

work entitled ***Development of stimuli-responsive cellulose nanocrystals hydrogels for smart applications.***

This project consists to develop and study new hybrid structures based on nanocelluloses and stimuli-responsive polymers, in particular, thermo-responsive polymers. Nanocelluloses - nanoparticles extracted from cellulose - exist in two forms: cellulose nanocrystals (CNC) and cellulose nanofibrils (CNF).

This study focused on the design of CNC hydrogels with stimuli-responsive polymers. Several thermo-responsive polymers have been used for their biocompatibility and lower critical solution temperature (LCST) close to body temperature. This work consisted of preparation of systems using the principles of green chemistry, the rheological study of these thermo-sensitive hydrogels, and the development of smart applications for these unique biomaterials.

Through the use of state of the art technologies (SANS, SAXS), physicochemical interactions between the polymers and CNC have been studied. The use of block copolymers made it possible to create CNC-based hydrogels with specific rheological properties: liquid at ambient temperature to gel at body temperature. These hydrogels can be used in the creation of injectable systems for biomedical applications, as well as thermosensitive surfaces.

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