ZELLCHEMING-CONFERENCE
CELLULOSE-BASED MATERIALS –
FROM SCIENCE TO TECHNOLOGY

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NADES – Assisted Production of Fibrillated Cellulose

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Abstract

The pretreatment of cellulose fibers in NADES (Natural Deep Eutectic Solvents) benefits from a reduction of strong hydrogen bonds in the cellulose structure by the solvent. The influences of different NADES compositions and preliminary swelling conditions are investigated in relation to the morphological changes and microstructural variations of softwood pulp fibers. The swelling evokes exposure of single microfibrils without significant fiber dissolution, while the crystalline fiber structure remains unaltered. The consequent homogenization of the swollen fibers provides full fibrillation of the fibers into a very fine fibrous network. The processing conditions of the selected NADES with critical balance between fiber disintegration and dissolution seems better tunable compared to ionic liquids. The latter experimental observations are explained by molecular modelling. The local variations in cellulose microstructure are monitored by in-situ confocal Raman spectroscopy in relation to traditional analytical techniques, confirming good relationships for crystallinity changes between FTIR, XRD and solid-state NMR.

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Biography

Pieter Samyn studied from 1996-2001 Materials Science and Engineering at Ghent University (Belgium) and completed his Ph.D. in 2007 on polymer tribology. After post-doc positions at Department of Textiles (Ghent) and Department of Microsystems Engineering (Freiburg), he was appointed as a Juniorprofessor in Bio-based Materials Engineering at University of Freiburg (2010-2016). He moved to University of Hasselt in 2016, focusing on valorization of forest resources as nanoscale building blocks for functional biocomposites and devices. In particular, he works on the processing of bio-based composites and papers providing new surface properties and technological functionalities, such as barrier coatings, superhydrophobicity, adhesion, interface compatibility, printing properties, controlled release mechanisms.