New processes for the production of Micro/Nano-Fibrillated Cellulose (M/NFC)

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Abstract

Micro/Nano-Fibrillated Cellulose (M/NFC) constitutes a new material with very interesting properties and numerous applications. Derived from plant fibers, M/NFC have a high aspect ratio, a very large specific surface and can be used in suspension as viscosity modifiers, for the production of films and nanopapers in the field of packaging, for the production of aerogels or hydrogels, for example. Their chemical functionalization, facilitated by the presence of numerous hydroxyl groups at their surface, makes it possible to give them specific properties (fireproof, antibacterial, hydrophobic, etc.). The main obstacle to their use remains the energy consumption necessary for their production, i.e. the microfibrillation stage, generally carried out in grinders or homogenizers. These processes allow the individualization of the microfibrils constituting the fiber wall.

This presentation will focus on the description of new mechanical and physico-chemical pre-treatments (steam explosion, twin-screw extrusion, use of deep eutectic solvents), as well as their effects on the energy consumption during the main mechanical process (grinding). The quality of the obtained materials will be discussed. The special case of lignin-containing M/NFCs will also be addressed. All the results presented aim at showing how the use of certain processes can limit the environmental impact of the production chain of these bio-based and biodegradable materials.