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Ph.D. thesis (2023-2026)
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Lignocellulosic biorefinery: Development of a new pulping process to produce high-quality fibers from underexploited resources

Bioraffinerie lignocellulosique : Développement d'un nouveau procédé de mise en pâte pour la production de fibres de haute qualité à partir de ressources sous-exploitées

BioChip

Context / Objectives

Underexploited biomass:
Huge quantities are available

- Wastes of industrial biomass
- Underexploited sources: hemp, nettle and poplar residues available in local areas

The Kraft process is a strongly alkaline process
Large plants with limited flexibility

- Soft alkaline pulping processes are in the trend
- Total Chlorine Free (TCF) bleaching sequence is a must
- Smaller cooking units for smaller biomass quantities

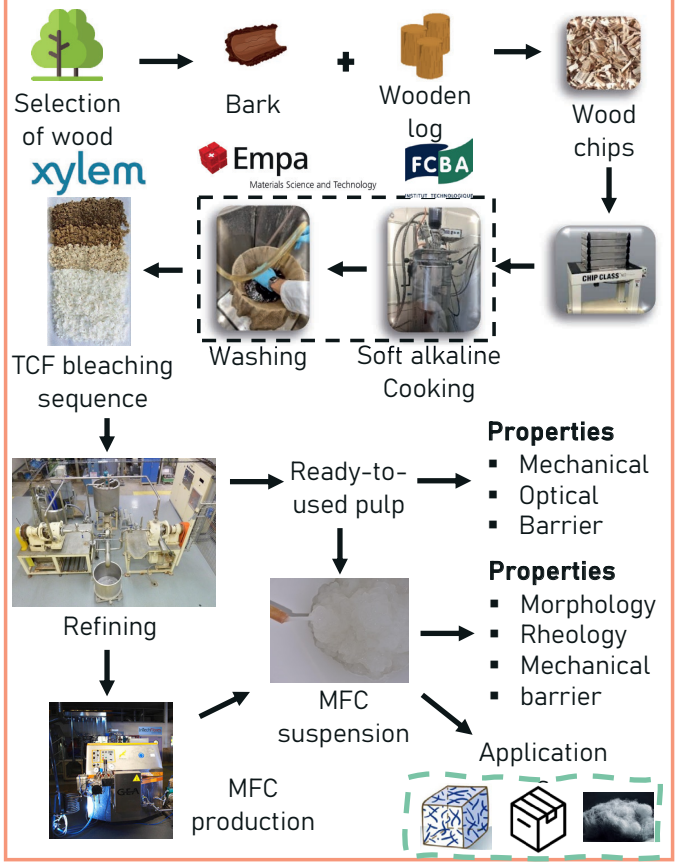
MicroFibrillated Celluloses (MFC) are in current development for their good properties

- Reinforcement in composites
- Packaging applications for barrier properties
- Textile utilization

Funded by: FCBA Institut Technologique, Cifre Conventions, ANRT Association Nationale Recherche Technologie, Bio-LUSH

Methods

Process – at lab and/or pilot scale

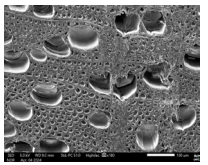


Results

Analysis of 5 poplar species

- Chemical composition
- Fiber morphology

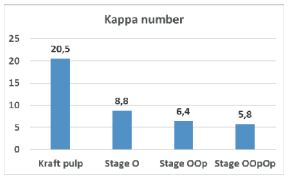
→ One species selected

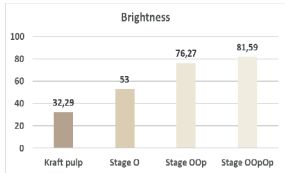


SEM images

Kraft cooking → TCF bleaching

Studying the diffusion of chemicals into wood chips





Evolution of properties at each stage

Endoglucanase treatment → Ultraturax treatment → MorFi

Evolution of fiber length