

MWP – Young Researcher Abstract 2026

Project title: Engineering cellulose fibers and nanocellulose: sustainable processing and data-driven structure-property relationships for industrial applications	
Author: Giovana Signori lamin	
Affiliation: Universitat de Girona (LEPAMAP-PRODIS Research Group)	E-mail: giovana.signori@udg.edu
Abstract (approx. 200 words): The transition toward a sustainable bioeconomy requires the forest-based industry to improve resource efficiency for developing renewable alternatives to fossil-based materials. My research at LEPAMAP-PRODIS (Universitat de Girona) focuses on the processing of cellulose fibers for papermaking and CNF (cellulose nanofibers) production. The work investigates high-consistency enzymatic pulp refining, TEMPO-mediated oxidation and high-pressure homogenization for CNF production, combining experimental studies with machine learning to understand and optimize fiber modification processes. This research contributes for the development of more efficient productions routes for cellulose-based materials, with potential benefits in reduced energy consumption, improved material performance and enhanced use of renewable forest resources. Such advances may support the demand for sustainable materials in applications such as packaging, emulsions and adsorbents for wastewater treatment. A key opportunity for the sector lies in combining process innovation with digital tools that facilitate process optimization and scale-up. However, challenges remain, including energy intensity of CNF production and the transfer of laboratory-scale developments to industrial practice. Addressing these will require continued collaboration between academia and industry, as well as the integration of experimental research and data-driven models to support sustainable and competitive forest-based products.	
Key words: Cellulose Nanofibers; Machine Learning; Papermaking; Process Engineering	