

MWP – Young Researcher Abstract 2026

Project title: Scalable Nanocellulose Engineering for High-Performance Sustainable Materials	
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Abstract (approx. 200 words): Industrial processes in the forest-based sector require sustainable materials that deliver high performance without compromising production efficiency. My research addresses this challenge through the development of a novel cellulose nanofibril and microfibrillated cellulose (CNF/MFC) platform produced using controlled Fenton oxidation combined with mechanical fibrillation. This approach enables efficient fiber modification while introducing tailored surface functionalities that improve fibrillation, dispersion stability, and material performance. The developed CNF/MFC shows strong potential for industrial coating and packaging applications through enhanced barrier properties and improved cellulose network formation. The research further investigates how varying CNF/MFC content affects drainage resistance, water retention, vacuum dewatering, and tensile strength in hardwood pulp systems. The work identifies a critical fibrillation threshold where dewatering efficiency declines significantly and establishes an optimal CNF–hardwood ratio that maximizes mechanical performance through enhanced nanoscale interactions	
Key words: Cellulose nano fibril (CNF), Micro fibrillated cellulose (MFC), Cellulose, Fenton oxidation, Barrier coating, Surface modification	