

Defence announcement

Public Defence on 18 August 2023

Solving Material Challenges with Cellulose

Title of the doctoral thesis	Inherent and Tailored Properties of Cellulose — A Versatile Toolbox for Material Engineering
Content of the doctoral thesis	Cellulosic materials hold great potential for a circular bioeconomy, addressing challenges like plastic pollution and resource sufficiency. This thesis explored the inherent properties of cellulose and aimed to exploit them in innovative material solutions. First, the impact of chemical modifications on cellulose's mechanical strength and biodegradability was investigated, finding that increased modification reduced these properties. This highlighted the importance of controlled modification to preserve cellulose's inherent features, which was capitalized on in the following studies. By harnessing the hygroscopicity and porosity of cellulose nanomaterials (CNMs), small plastic particles were captured from water, offering innovative solutions for microplastic management. Additionally, the reactivity of CNMs was utilized in a controlled manner and they were combined with silk proteins. The interactions and alignment between these two materials were carefully characterized, showcasing their potential for filament formation. Finally, two CNMs, cellulose nanofibrils, and cellulose nanocrystals were combined in films to customize their optical properties without compromising mechanical and barrier performance. This thesis contributes to redefining the material bioeconomy and opens new avenues for the forest sector by harnessing cellulose's inherent and tailored properties simultaneously introducing new characterization methods for cellulose-based materials.
Field of the doctoral thesis	Bioproduct Technology
Doctoral candidate and contact information	M.Sc. (Tech.) Ilona Leppänen ilona.leppanen@vtt.fi
Public defence date and time	18 th August 2023 at 12 o'clock (in Finnish time)
Remote defence	https://aalto.zoom.us/j/68304564882
Place of public defence	Aalto University School of Chemical Engineering, Bioproduct Centre, lecture hall L1, Vuorimiehentie 1, Espoo
Opponent(s)	Professor Tsuguyuki Saito, University of Tokyo, Japan
Custos	Professor Monika Österberg, Aalto University School of Chemical Engineering
Link to electronic thesis	https://aaltodoc.aalto.fi/handle/123456789/51
Keywords	nanocellulose, hygroscopicity, surface reactivity, chemical modification, biodegradation, cellulose-based films, water purification