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Defence announcement

Public Defence on 1st of September 2023

Surface interactions of cellulose fibers in water and foam – connection to the formed fiber structure properties

Title of the doctoral thesis	Surface and inter-fibre interactions in aqueous cellulose-based systems for open fibrous structures
Content of the doctoral thesis	In addition to paper and board-like materials, foam forming technology enables the production of very porous and lightweight structures. This expands the possibilities of using cellulose fibers in, for example, filter, insulation and soft packaging materials. Foam can also be used to mix other challenging components, such as fibers of several millimeters in length and very light filler particles, into the fiber structures. When designing new materials, it is important to understand how the fibers behave in the foam and how this behavior affects the properties of the final product. In the thesis, the properties of wet wood fiber surfaces and the interaction between air bubbles and cellulose model surfaces and real fibers were investigated. Refined fiber surfaces were found to be gel-like in wet state, which was connected to the increased elongation of the dry fiber networks. Model surface studies revealed that hydrophilic cellulose surfaces and bubbles had weak attractive interaction. The interaction got stronger when the hydrophobicity of cellulose increased and weakened when a surfactant was added. The properties of the manufactured foam formed structures varied depending on the type of fiber and the surfactant. The differences were seen especially in fiber orientation and in strength behavior. These observations increase the general understanding of the fiber surface properties and the interaction mechanisms between bubbles and cellulose fibers in fiber-foams. The information can be applied with both water-, and foam forming processes in the production of cellulose-based materials.
Field of the doctoral thesis	Bioproduct technology
Doctoral candidate and contact information	M.Sc. (chem) Annika Ketola annika.ketola@vtt.fi
Public defence date and time	1st of September 2023 at 12 o'clock (in Finnish time)
Remote defence	https://aalto.zoom.us/j/66973026442
Place of public defence	Aalto University School of Chemical Engineering, Aalto Bioproduct Centre, Lecture hall L1, Vuorimiehentie 1, Espoo
Opponent(s)	Professor Chunlin Xu, Åbo Akademi University, Finland
Custos	Professor Orlando Rojas, Aalto University School of Chemical Engineering
Link to electronic thesis	https://aaltodoc.aalto.fi/handle/123456789/51
Keywords	Wood fibre surface morphology, surface fibrils, cellulose microfibrils (CMF), gel-like fibre surface, critical point drying, freeze drying, bubble-cellulose interactions, foam forming, model surfaces, hydrophobised cellulose, lightweight materials

Dissertation will be on public display at https://aaltodoc.aalto.fi/doc_public/eonly/riiputus/