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Defence announcement **Public Defence on 1st of March 2024**

Materials from silk proteins

Title of the doctoral thesis	Exploring silk protein assembly mechanisms for high-performance materials
Content of the doctoral thesis	Due to the unique structure of silk proteins, they possess various beneficial properties such as high tensile strength, flexibility, and biodegradability. The most promising silk proteins are found in spiders. Although acquiring these proteins directly from nature is challenging, the application of genetic engineering allows to produce large quantities of "recombinant" silk proteins. However, the challenge remains in determining the additional processes needed to manufacture durable silk-based materials from the produced recombinant silk. Previous studies indicate that solutions lie in the complex spinning mechanism of silk-producing animals. The doctoral thesis initially focused on the spinning mechanism of silkworm silk. The protein content in the gland was mapped by measuring the variation of amino acids, correlating with the silk mass's ability to form fibers. This ability was further enhanced by a simple adjustment of acidity. Subsequently, the research addressed the production of fibers from recombinant silk and regenerated silk. The separation of recombinant silk into different phases was identified as a crucial intermediate step for achieving high tensile strength in fibers. Finally, the study moved beyond fibers to discuss a method for producing water resistant, or hydrophobic, silk films. This hydrophobicity developed as the silk protein structures orderly arranged on the surface of the film. The arrangement occurred only under specific conditions, with high relative humidity and the right salt concentration identified as critical parameters. However, the films remained brittle, and further investigation is needed to enhance their durability.
Field of the doctoral thesis	Biotechnology
Doctoral candidate and contact information	M.Sc. (Tech.) Teemu Välisalmi teemu.valisalmi@aalto.fi
Public defence date and time	1st of March 2024 at 12 o'clock (in Finnish time)
Remote defence	https://aalto.zoom.us/j/65761247842
Place of public defence	Aalto University School of Chemical Engineering, Lecture hall Ke2, Kemistintie 1, (main door at Biologinkuja) Espoo
Opponent	Professor Yael Politi, Dresden University of Technology, Germany
Custos	Professor Markus Linder, Aalto University School of Chemical Engineering
Link to electronic thesis	https://aaltodoc.aalto.fi/items/de6bf1d0-8c09-464b-9ea4-66ca7237d744
Keywords	Silk protein, regenerated silk, film, fiber, phase separation, water resistance