

Defence announcement

Public Defence on 18 October 2024

Building silk proteins for functional materials

Title of the doctoral thesis	Assembly of silk-like proteins towards functional bio-inspired materials
Content of the doctoral thesis	Proteins are nature's primary building blocks and can be assembled into advanced, sustainable, and high-performance materials that meet diverse needs. Liquid-liquid phase separation (LLPS), a prevalent phenomenon in nature, has been found involved in the organization and function of living cells and the formation of functional materials outside cells. LLPS separates mixtures into two phases: a dense phase (coacervates or condensates) and a dilute phase. This process has become important for designing new biological materials. In this thesis, silk-like proteins were used as building blocks to develop functional materials through LLPS, aided by the SpyCatcher-SpyTag protein pair. This research led to the development of a strong adhesive by combining silk-like proteins with mussel foot proteins. It also utilized the intrinsically disordered sequence from spider silk to selectively recruit proteins into silk-like protein-based condensates. Additionally, the study found that phosphate induces β-sheet structures in silk proteins, affecting fiber formation, and explored the assembly pathways involved in LLPS. Overall, this research provides strategies and insights for designing silk-based materials with specific properties, such as adhesives, selective recruitment condensates, and fibers, thereby expanding the possibilities for biomaterials inspired by nature.
Field of the doctoral thesis	Biotechnology
Doctoral candidate and contact information	M.Sc. (Tech.) Yin Yin yin.yin@aalto.fi
Public defence date and time	18 October 2024 at 12 o'clock (in Finnish time)
Remote defence	https://aalto.zoom.us/j/61745834343
Place of public defence	Aalto University School of Chemical Engineering, Lecture hall Ke2 (Komppa-Sali), Kemistintie 1, Espoo
Opponent	Professor Kristaps Jaudzems, Latvian Institute of Organic Synthesis, Latvia
Custos	Professor Markus Linder, Aalto University School of Chemical Engineering
Link to electronic thesis	https://aaltodoc.aalto.fi/handle/123456789/51
Keywords	liquid-liquid phase separation, silk protein, mussel foot protein, SpyCatcher-SpyTag, adhesive, coacervate, condensate, fiber