The New Road to Silk: Bio-based Production of Silk-like Materials (Newsilk)

This project is addressing the challenge of how materials can be made in a sustainable way. Plastics that are used today are not sustainable in the long run, partly because of the raw material is fossil, and partly because too much of the plastics end up in the environment despite large efforts on recycling. To create a fully biological material that both can be made from bio-feedstock and does not accumulate in tour environment, we work on silk as a material. Silk is made of protein which is a polymer. Plastics are also made of polymers, but on a molecular scale these different polymers behave very differently. In the NEWSILK project we combine polymer chemistry and biotechnical silk protein production to understand how silk protein polymers should be processed in order to form new materials such as fibers, adhesives, coatings, or composite structures. In the NEWSILK project we also work together with designers and artists to help communicate our work and to be part of the creative process in developing new concepts for material use when new processes and components open new ways to make materials.

We have worked on the polymer-behavior of silk proteins and studied different factors that affect how they self-assemble in to different molecular assemblies, and we have also studied the thermodynamic basis for how silk proteins interact when assembling into materials. We have also used computer simulations to understand the molecular mechanisms of polymer assembly. Designers and scientists have worked together to communicate their ideas and linking the design process with the scientific process of materials design.

We are now working on constructing new silk proteins that will lead to solving critical question that still limit the use of biotechnically produced silk. Art and design are taken into this process.
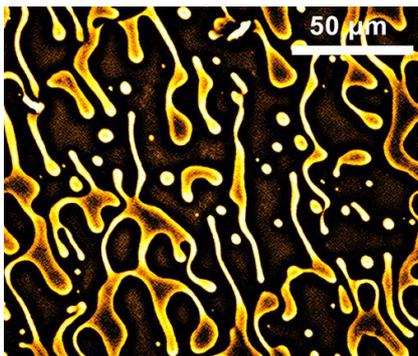

Figure. Silk molecules are assembling together to form fiber materials. Picture by Pezhman Mohammadi.

Contact information:
Markus Linder, markus.linder(at)aalto.fi