Abstract Submitted
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Elongational Flow Assists with the Assembly of Protein Nanofibrils[1] NITESH MITTAL, AYAKA KAMADA, CHRISTOFER LENDEL, FREDRIK LUNDELL, DANIEL SODERBERG, KTH Royal Institute of Technology — Controlling the aggregation process of protein-based macromolecular structures in a confined environment using small-scale flow devices and understanding their assembly mechanisms is essential to develop bio-based materials. Whey protein, a protein mixture with β-lactoglobulin as main component, is able to self-assemble into amyloid-like protein nanofibers which are stabilized by hydrogen bonds. The conditions at which the fibrillation process occurs can affect the properties and morphology of the fibrils. Here, we show that the morphology of protein nanofibers greatly affects their assembly. We used elongational flow based double flow-focusing device for this study. In-situ behavior of the straight and flexible fibrils in the flow channel is determined using small-angle X-ray scattering (SAXS) technique. Our process combines hydrodynamic alignment with dispersion to gel-transition that produces homogeneous and smooth fibers. Moreover, successful alignment before gelation demands a proper separation of the time-scales involved, which we tried to identify in the current study. The presented approach combining small scale flow devices with in-situ synchrotron X-ray studies and protein engineering is a promising route to design high performance protein-based materials with controlled physical and chemical properties.

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