Abstract Submitted
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Probing the Biophysics behind Flow-induced Amyloid Crystallization[1] SAMANTHA MCBRIDE, SEAN SANFORD, Rensselaer Polytechnic Institute, JUAN LOPEZ, Arizona State University, AMIR HIRSA, Rensselaer Polytechnic Institute — Agitation of fluid is known to induce formation of amyloidogenic species from native protein, yet the exact biophysical mechanism is unknown. Previous investigations indicate that shearing flows are important to formation, suggesting that amyloid crystallization is not a simple transport-limited reaction. Shear-induced deformation of protein monomers has been proposed, yet extensional forces used in most experiments are insufficient to pull apart the hydrogen bonds that constrain protein monomers in a folded state. Other hypotheses suggest that flow induces fibrillization via alignment of protein monomers or by enhancing transport to hydrophobic interfaces. Experiments using a uniform Couette device with a rotating outer wall have shown that even minute Reynolds numbers result in enhanced crystallization kinetics. Furthermore, experiments using two highly similar proteins with different protein-protein binding affinities have provided clues towards isolation of the biophysical mechanism. Experimental evidence from the current work will be presented alongside evidence from the literature, and the relative merits of different hypotheses regarding the mechanism of shear-induced crystallization will be discussed.

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