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Effects of bulk and free surface shear flows on amyloid fibril formation DAVID POSADA, MIRCO SORCI, GEORGES BELFORT, AMIR HIRSA, Rensselaer Polytechnic Institute — Amyloid diseases such as Alzheimer's and Huntington's, among others, are characterized by the conversion of monomers to oligomers (precursors) and then to amyloid fibrils. Besides factors such as concentration, pH, and ionic strength, evidence exists that shearing flow strongly influences amyloid formation in vitro. Also, during fibrillation in the presence of either gas or solid surfaces, both the polarity and roughness of the surfaces play a significant role in the kinetics of the fibrillation process. By studying the nucleation and growth of a model system (insulin fibrils) in a well-defined flow field, we can identify the flow and interfacial conditions that impact protein aggregation kinetics. The present flow system consists of an annular region, bounded by stationary inner and outer cylinders and driven by rotation of the floor, with either a hydrophobic (air) or hydrophilic (solid) interface. We show both the combined and separated effects of shear and interfacial hydrophobicity on the fibrillation process, and the use of interfacial shear viscosity as a parameter for quantifying the oligomerization process.

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