Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Flow-induced protein crystallization: Macroscopic effects on 2D crystals JAMES YOUNG, DAVID POSADA, AMIR HIRSA, Rensselaer Polytechnic Institute, JUAN LOPEZ, Arizona State Univeristy — Proteins must first be crystallized before their molecular structure can be studied in detail. However, crystallizing protein is a challenging task which is often met with limited success. Although 2-D protein crystals at the air/water interface are usually obtained under quiescent conditions, it was recently shown that crystallization can be enhanced by a shearing flow. Here we examine the relationship between Reynolds number and the crystal growth process using the deep-channel surface viscometer geometry. It consists of an annular region bounded by stationary inner and outer cylinders and driven by a constant rotation of the floor. The interfacial velocity measurements are compared to Navier-Stokes computations with the Boussinesq-Scriven surface model. The interfacial film is lifted onto a solid substrate, and the protein crystals are observed via optical and atomic force microscopy. For a particular protein surface concentration, a Reynolds number threshold has been identified for flow-induced crystallization. This flow geometry also allows for the determination of the surface shear viscosity, which provides a quantitative measure of the mesoscale interactions associated with protein crystallization.

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Date submitted: 03 Aug 2012 Electronic form version 1.4