Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Protein crystallization induced and enhanced via hydrodynamics: Forced crystallization. ALI AZADANI, AMIR HIRSA, Rensselaer Polytechnic Institute — The ability to describe and utilize protein structure has made possible the rational design of new drugs and pharmacological agents. Proteins must be first crystallized in order to utilize the techniques that yield a precise description of their structure. Two-dimensional protein crystallization at the air-water interface entails the specific binding of a protein to a lipid monolayer containing a ligand. There are several classic crystallization strategies such as varying the ionic strength, pH, and temperature of the protein solution; in all of these, fluid motion is reported to be detrimental. However, we have discovered that fluid dynamics can be used to advantage. The flow system utilized consists of a stationary open cylinder driven by the constant rotation of the floor, in the axisymmetric flow regime with inertia. We show that by applying shear stress to the protein-ligand complexes at the interface, it is possible not only to control the protein-protein interaction and induce crystallization, but also, by varying the Reynolds number, regulate the rate of nucleation and growth separately which were always a challenge for crystallographers.

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Date submitted: 04 Aug 2006 Electronic form version 1.4