UNIVERSITY OF CONNECTICUT

INSTITUTE OF MATERIALS SCIENCE

POLYMER PROGRAM SEMINAR

"Frictional Interactions in Viscous Suspensions: Abrupt Shear Thickening and the Flow-induced Jamming Transition"

Prof. Jeffrey F. Morris
The City College of New York

Friday, October 17, 2014
11:00 AM, IMS Room 20

Particles suspended in a Newtonian fluid raise the viscosity, and there is generally also a shear rate dependence of the suspension rheology. In particular, pronounced shear thickening is one of the phenomena observed at large solid volume fraction. In recent work [1, 2], our team has have considered through a simulation study the minimum set of components to reproduce experimentally observed shear thickening behaviors, including the extremely abrupt or "discontinuous" shear thickening (DST). We have found frictional contact forces to be of essential importance.

The viscosity divergence at a maximum packing volume fraction has been a well known behavior in suspension rheology, as is reflected in many empirical laws for the viscosity. This divergence can be identified with the jamming transition, as it is known in granular physics. Friction can affect this divergence, and in particular the maximum packing fraction is reduced if particles are frictional. Shear thickening can be seen as a direct consequence of this shift: as the shear rate increases, friction is increasingly mobilized as more contacts form, leading to a transition from a frictionless to a predominately frictional rheology. I will provide an overview of results of a frictional-viscous model of sheared suspensions and its predictions. Though in its first elaboration our simulational model has targeted non-Brownian suspensions, the same mechanism is found in recent work to explains shear thickening of Brownian colloidal suspensions, as will be shown by comparison to experimental data in the literature.

**For further information, please contact YH Chudy ychudy@ims.uconn.edu*

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