

ICTS Seminar

Title : Microscopic origin of frictional rheology in dense suspensions

Speaker : Kabir Ramola, Brandeis University, USA

Date : Tuesday, December 4, 2018

Time : 11:00 AM

Venue : Emmy Noether Seminar Room, ICTS Campus, Bangalore

Abstract : Dense non-Brownian suspensions of frictional grains in a fluid often display an increase in viscosity (thickening) as the confining shear stress or strain rate are increased. At a critical density dependent shear rate, the viscosity increases abruptly: a phenomenon termed Discontinuous Shear Thickening (DST). We develop a statistical framework for the rheology of such suspensions, treating the ensemble of steady state configurations obtained from simulations of suspensions as a "thermal" ensemble. We construct a free energy function for the anisotropy of the stress tensor (μ), based on a pair correlation function in a space representing forces, which is dual to position space. We show that our theory predicts a DST flow diagram that is in good agreement with numerical simulations, and the qualitative features of μ that lead to the generic flow diagram of a DST fluid observed in experiments.