Structure and dynamics of thin colloidal films

Payam Bagheri
Department of Physics and Physical Oceanography
Memorial University

DATE: Wednesday, December 16, 2015
TIME: 3:30 PM
PLACE: C3024

ABSTRACT: Abstract: This thesis begins by studying the thickness of evaporative spin coated colloidal crystals and demonstrates the variation of the thickness as a function of suspension concentration and spin rate. Particularly, the films are thicker with higher suspension concentration and lower spin rate. This study also provides evidence for the reproducibility of spin coating in terms of the thickness of the resulting colloidal films. These colloidal films, as well as the ones obtained from various other methods such as convective assembly and dip coating, usually possess a crystalline structure. Due to the lack of a comprehensive method for characterization of order in colloidal structures, a procedure is developed for such a characterization in terms of local and longer range translational and orientational order. Translational measures turn out to be adequate for characterizing small deviations from perfect order, while orientational measures are more informative for polycrystalline and highly disordered crystals. Finally, to obtain an understanding of the relationship between dynamics and structure, the dynamics of colloids in a quasi-2D suspension as a function of packing fraction is studied. The tools that are used are mean square displacement (MSD) and the self part of the van Hove function. The slow down of dynamics is observed as the packing fraction increases, accompanied with the emergence of 6-fold symmetry within the system. The dynamics turns out to be non-Gaussian at early times and Gaussian at later times for packing fractions below 0.6. Above this packing fraction, the dynamics is non-Gaussian at all times. Also the diffusion coefficient is calculated from MSD and the van Hove function. It goes down as the packing fraction is increased.

The presentation is expected to be around 30min. Everyone is most welcome!