CMET Seminar

UNIVERSITY OF DELAWARE

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DATE:
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TIME:
2:00 p.m.
LOCATION:
366 CLB

Sepideh Razavi received her Masters' degree in Chemical Engineering from Sharif University of Technology, Iran in 2007. From 2007 to 2009, she was a research assistant in Prof. A. Shojaei's lab at Sharif University, working on rheological and mechanical behavior of recycled-based polymeric composites with application as composite railroad ties. In 2010, she joined the Chemical Engineering Department at the City College of New York and is currently pursuing her doctoral degree. Her research focuses on the behavior of colloidal particles at interfaces using both experimental and simulation tools. More specifically, she is studying the impact of the particle surface wettability and amphiphilicity on dynamics of binding to an interface and the response of the resulting particle-laden interfaces to deformation.

"Colloidal Particles and Fluid Interfaces: Approach, Breach and Flow Behavior"

Recently, a great deal of attention has been focused on colloidal particles at interfaces owing to their substantial desorption energy that can be harnessed to stabilize fluid interfaces. The physical and chemical heterogeneity of the particle surface is known to influence the interaction of colloidal particles with fluid interfaces; hence, to render an interface stable, proper wettability and suitable surface properties are essential. For instance, amphiphilic (Janus) particles are believed to bind particularly strongly to interfaces and form a breathable interfacial skin. The dynamics of such colloidal particles moving towards and onto an interface is therefore of considerable interest. Using digital holography microscopy and molecular dynamics simulations, we have analyzed the motion of a Janus particle adjacent to a liquid interface by monitoring the translational and rotational dynamics as the particle approaches and then binds to the interface. Based on our findings, the particle behavior shows strong orientation dependence both before and after breaching.

In addition to binding dynamics and interfacial configuration of colloidal particles, the flow behavior of colloidal monolayers formed at the interface contributes to stability because in many of the applications that involve particle-laden interfaces, the interface undergoes large deformations. The response of interfacial layers to compression has been examined in the literature and different collapse mechanisms have been reported, including monolayer buckling and expulsion of particles from the interface. Despite the large body of work on particles at interfaces, the key factors governing the mode of collapse have not been clearly identified. To better understand how particle surface properties impact instabilities at fluid interfaces, we have studied interfaces decorated with plain particles of different surface wettabilitiy as well as amphiphilic Janus particles and their response to compression. Our results provide insight on the consequential role of particle-particle and particle-interface interactions in determining the stability and collapse of particle-laden interfaces.