MAE Seminar SERIES

Computational Modeling of Colloids at Fluid Interfaces

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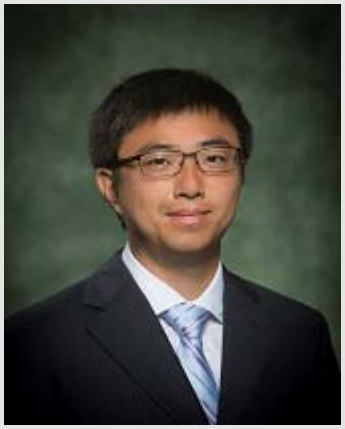

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ABSTRACT

Colloidal particles at fluid-fluid interfaces exhibit rich transport and interfacial phenomena. This multi-component, multi-phase system not only allows researchers to explore a variety of fundamental questions in colloid and interface science, but also plays important roles in many practical applications. For example, the use of the fluid-fluid interface as a two-dimensional template facilitates the assembly of colloidal monolayers with diverse microstructures, which opens a new avenue for manufacturing thin film materials. On the other hand, the presence of particles in turn modulates the mechanical properties of the interface and enables Pickering emulsions and armored droplets. Despite extensive studies in the last decade, our understanding of the dynamics of particle-laden interfaces is still limited due to the complexity of underlying physics. The interplay of particle adsorption/desorption, capillary interaction, and surface hydrodynamics and heat transfer needs to be uncovered to allow better use of this interfacial system. This presentation will discuss recent advances in computer simulations for understanding the behavior of colloids at fluid interfaces, focusing on two exemplary problems. The first one is particle dynamics on the surface of evaporating liquid masses. This problem is related to the well-studied coffee-ring effect but provides new insight into how the interfacial transport and assembly of particles modulates deposition structures. The second problem discusses how stimuli-responsive colloids control droplet impact and coalescence, which will contribute to the design of switchable emulsions.

BIO SKETCH

Xin Yong is currently an assistant professor of mechanical engineering and associated faculty member of the Materials Science and Engineering program at Binghamton University. He received his B.S. in physics at Peking University in 2007 and Ph.D. in mechanical engineering from Rensselaer Polytechnic Institute (RPI) in 2012. After graduation, he completed a postdoctoral training in the department of chemical and petroleum engineering at the University of Pittsburgh. His research focuses on computational simulations and mathematical modeling of transport processes and interfacial phenomena in soft matter, including colloids, polymer, and biomolecular systems, which are funded by NSF, NIH, and industries. He is a recipient of the Doctoral New Investigator award from the American Chemical Society Petroleum Research Fund.

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