



Massachusetts
Institute of
Technology

SMSD SEMINAR SERIES

Soft Materials Structures and Devices

Thursday, February 13th 2020, 4pm, Room 3-370*

* Please note new seminar room location for this semester

Coupled Dynamics of Particles and Fluid-Fluid Interface: Instabilities & Failure Modes

Professor Sungyon Lee

University of Minnesota

In this talk, we will discuss two distinct physical scenarios in which non-colloidal particles couple to the fluid-fluid interface, leading to new instabilities. In the first part of the talk, we present the instability at the oil-air interface, when the mixture of particles and oil displaces air inside a Hele-Shaw cell. Our experimental results show that the characteristics of fingering depend on the particle volume fraction and on the relative particle size. We discuss the physical mechanism behind this “particle-induced viscous fingering” and present a reduced model to rationalize the critical wavenumber of instability. In the second part of the talk, we experimentally and analytically investigate the dynamics of particle aggregates on a fluid-fluid interface (called “particle raft”) under isotropic compression. Axisymmetric compression of the raft is imposed by draining fluid from the funnel, and experiments reveal two different modes of failure upon jamming: individual particle falling versus collective folding. We mathematically examine the two modes of raft collapse as a function of particle size and fluid densities.

Seminar Host: Irmgard Bischofberger (irmgard@mit.edu)

Please join us for refreshments beforehand, outside Room 3-370

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