Abstract Submitted
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Gravity-induced encapsulation of an armored droplet[1] ALIREZA HOOSHANGINEJAD, Department of Biological and Environmental Engineering, Cornell University, ELLEN LONGMIRE, Department of Aerospace Engineering and Mechanics, University of Minnesota, SUNGYON LEE, Department of Mechanical Engineering, University of Minnesota — Droplets coated with a protective armor of particles are relevant in stabilization of emulsions and foams that are widely used in many industrial applications, such as pharmaceutical, food, and cosmetics. These armored droplets can form by rolling droplets on a bed of hydrophobic particles [1] or by destabilizing a granular raft of negatively buoyant particles on a fluid interface [2]. In a series of experiments, we investigate an armored droplet of water-isopropanol mixture settling through oil and approaching an oil-water interface. The armored droplet is observed to undergo either rupture or encapsulation, as we systematically vary key physical parameters, such as particle size, particle density, oil viscosity and interfacial tension. In this talk, we discuss the physical mechanism that leads to the two distinct behaviors and identify the key dimensionless parameters that characterize the transition between the two regimes. [1] P. Aussillous and D. Quere, Nature, 2001, 411, 924–927. [2] M. Abkarian, S. Protiere, J. Aristoff, and H. Stone, Nature Communications, 2013, 4, 1895.

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