Abstract Submitted
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ALE-Phase-field simulations of floating particles PENGTAO YUE, Virginia Tech — In this talk, we will present a hybrid Arbitrary-Lagrangian-Eulerian(ALE)-Phase-Field method for the direct numerical simulation of multiphase flows where fluid interfaces, moving rigid particles, and moving contact lines coexist. Practical applications include Pickering emulsions, froth flotation, and biolocomotion at fluid interface. An ALE algorithm based on the finite element method and an adaptive moving mesh is used to track the moving boundaries of rigid particles. A phase-field method based on the same moving mesh is used to capture the fluid interfaces; meanwhile, the Cahn-Hilliard diffusion automatically takes care of the stress singularity at the moving contact line when a fluid interface intersects a solid surface. To fully resolve the diffuse interface, mesh is locally refined at the fluid interface. All the governing equations, i.e., equations for fluids, interfaces, and particles, are solved implicitly in a unified variational framework. In the end we will present some recent results on the water entry problem and the capillary interaction between floating particles (a.k.a. the Cheerios effect), with a focus on the effect of contact-line dynamics.

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