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Arbitrary Lagrangian-Eulerian simulations of particle and bubble dynamics in non-Newtonian fluids PENGTAO YUE, Virginia Tech — Fluid rheology affects particle-bubble interaction in various ways. For example, it modifies the migration of a single particle and a single bubble as well as the film drainage when they get close. In this talk, we will investigate these non-Newtonian effects using an arbitrary Lagrangian-Eulerian method which simultaneously tracks rigid particle surfaces and deformable bubble surfaces. The gas motion inside each bubble is neglected, and we only consider the bubble pressure which is determined by the isothermal ideal gas law. The particle motion and the fluid motion are solved in a unified Galerkin finite-element framework, in which the hydrodynamic forces and moments between the particle and the surrounding fluid cancel out. Mesh refinement is enforced where the surface curvature is high and where two boundary segments are close; the latter guarantees a sufficient resolution of the film drainage process. Numerical results on bubble migration and particle-bubble interaction in viscoelastic fluids and shear-thinning fluids will be presented.

Pengtao Yue
Virginia Tech

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