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3D Phase-Field Simulations of Interfacial Dynamics in Viscoelastic Fluids with Adaptive Meshing CHUNFENG ZHOU, Department of Chemical and Biological Engineering, University of British Columbia, PENGTAO YUE, Department of Mathematics, Virginia Polytechnic Institute and State University, JAMES J. FENG, Department of Chemical and Biological Engineering & Department of Mathematics, University of British Columbia, CARL F. OLLIVIER-GOOCH, Department of Mechanical Engineering, University of British Columbia, HOWARD H. HU, Department of Mechanical Engineering and Applied Mechanics, University of Pennsylvania — We have developed a diffuse-interface algorithm for computing two-component interfacial flows of Newtonian and non-Newtonian fluids in 3D. An adaptive meshing scheme produces fine grid near the interface and coarse mesh in the bulk, and leads to accurate resolution of the interface at moderate computational cost. Another advantage of the method is that there is no need for manual intervention during topological changes of the interface such as rupture and coalescence. However, the fully implicit time-stepping results in a large matrix system for complex 3D flows, with high demands for memory and CPU speed. As validating examples, we discuss a drop spreading on a partially wetting substrate and drop deformation in Newtonian and viscoelastic fluids. The results show very good agreement with those from the literature and our own 2D axisymmetric simulations.

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