

Abstract Submitted
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Phase field method for interfacial fluid flow with soluble surfactant¹ MINH DO-QUANG, Research Associate, STEFAN ENGBLOM, Postdoc, ANNA-KARIN TORNBERG, Associate Professor, GUSTAV AMBERG, Professor, LINNE FLOW CENTER, MECHANICS DEPT., ROYAL INSTITUTE OF TECHNOLOGY, STOCKHOLM, SWEDEN TEAM, LINNE FLOW CENTER, CSC/NA, ROYAL INSTITUTE OF TECHNOLOGY, STOCKHOLM, SWEDEN TEAM — In this study, a simulation of flow of two immiscible fluids with a soluble surfactant is studied using a diffuse interface formulation. The finite element method with adaptive mesh refinement is used to solve the Navier-Stokes equations together with the phase field equation. This system allows us to simulate the motion of a free surface in the presence of surface tension and the effect of surfactant. The method is validated for simple test cases and the computational results are found to be in a good agreement with the analytical solutions. The method is then being applied to study the effect of surfactant on motion and deformation of buoyancy-driven bubbles, and drop breakup and coalescence in a circular tube. We also discuss the free energy used in this approach and some ways to improve it.

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