Theoretical Studies of Flow-Induced Coalescence

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We report on recent boundary integral simulations of the flow induced coalescence of a pair of drops in the creeping flow limit. These calculations are based upon a classical sharp interface model, with “retarded” van der Waals forces included via disjoining pressure approximation using Lifschitz theory to determine the appropriate value of the Hamaker constant corresponding to PBd drops and a PDMS suspending fluid. The results show that a local film thickness of the order 100 angstroms (or less) is required for film rupture. We compare predictions of the drainage time for head-on collisions with experimentally measured values, as well as predictions and experimental data for the critical capillary number and the coalescence angle as a function of the capillary number corresponding to different non-head-on trajectories.