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Bubble coalescence in a Newtonian fluid VISHRUT GARG, OSMAN BASARAN, Purdue University — Bubble coalescence plays a central role in the hydrodynamics of gas-liquid systems such as bubble column reactors, spargers, and foams. Two bubbles approaching each other at velocity V coalesce when the thin film between them ruptures, which is often the rate-limiting step. Experimental studies of this system are difficult, and recent works provide conflicting results on the effect of V on coalescence times. We simulate the head-on approach of two bubbles of equal radii R in an incompressible Newtonian fluid (density ρ , viscosity μ , and surface tension σ) by solving numerically the free boundary problem comprised of the Navier Stokes and continuity equations. Simulations are made challenging by the existence of highly disparate lengthscales, i.e. film thickness and drop radii, which are resolved by using the method of elliptic mesh generation. For a given liquid, the bubbles are shown to coalesce for all velocities below a critical value. The effects of Ohnesorge number $Oh = \mu/\sqrt{\rho\sigma R}$ on coalescence time and critical velocity are also investigated.

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