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Coalescence of Drops of a Power-law Fluid PRITISH KAMAT, SUMEET THETE, OSMAN BASARAN, Purdue University — Drop coalescence is crucial in a host of industrial, household, and natural processes that involve dispersions. Coalescence is a rate-controlling process in breaking emulsions and strongly influences drop-size-distributions in sprays. In a continuum approach, coalescence begins by the formation of a microscopic, non-slender bridge connecting the two drops. Indefinitely large axial curvature at the neck results in local lowering of pressure that drives fluid from the bulk of the drops toward the neck, thereby causing the bridge radius $r(t)$ and height $z(t)$ to increase in time t. The coalescence of Newtonian drops in air has heretofore been thoroughly studied. Here, we extend these earlier studies by analyzing the coalescence of drops of power-law fluids because many fluids encountered in real applications, including cosmetic creams, shampoos, grease, and paint, exhibit power-law (deformation-rate thinning) rheology. On account of the non-slender geometry of the liquid bridge connecting the two drops ($z \ll r$), we analyze the resulting free surface flow problem by numerical simulation. Among other results, we present and discuss the nature of flows and scaling behaviors for r and z as functions of the initial viscosity and power-law index ($0 < n \leq 1$).

Osman Basaran
Purdue University

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