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Influence of viscoelasticity on bubble coalescence in wormlike micellar solutions VINEETH CHANDRAN SUJA, AADITHYA KANNAN, Chemical Engineering, Stanford University, BRUCE ANDREW KUBICKA, Portolla Valley High School, GERALD FULLER, Chemical Engineering, Stanford University — The stability of bubbles against coalescence in wormlike micellar (WLM) solutions is of importance for many industries. The viscoelasticity of the WLM solutions plays a key role in the bubble stability and can be tuned to change the various stages in the drainage of the thin film between bubbles leading to coalescence. Using a single bubble thin film interferometric technique, we have studied the influence of WLM solution (CTAB /Sodium Salicylate) viscoelasticity on the three stages of thin film drainage– the fluid entrainment, dimple formation and its stability, and the transition to a black film prior to coalescence. The fluid entrained decreased with a decrease in the viscoelastic moduli. The bubble also deformed resulting in the formation of a dimple. The dimple formation and its washout depends on the viscoelastic properties of the solution. For lower surfactant concentration, the dimples were seen to become unstable and have larger washout velocities. Further, depending on the relaxation time of the WLM solution, complex washout dynamics involving rapid dimple deceleration, recoil and oscillatory washouts are observed. As the film thins further, we observe stark step-wise transition to a black film, as opposed to pure surfactant systems that exhibit multiple steps.

Vineeth Chandran Suja
Stanford University

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