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Relaxation-induced coalescence with and without insoluble surfactants CAROLINA VANNOZZI, Univ of California - Santa Barbara — Rallison and Acrivos in 1978 investigated for the first time numerically the deformation and burst of a viscous drop in extensional flow. This seminal paper led to other important studies regarding the relaxation of viscous drops previously deformed in extensional flows, both for systems with and without surfactants. In this line of research we present the boundary integral simulations of the relaxation process of two viscous drops, previously undergoing a flow-induced head-on collision in an extensional flow, both with and without insoluble surfactants. The clean interface case showed that the acquired drop deformation induces a flow in the thin film between the drops as the interface relaxes back to restore the drop original shape [1]. Under certain circumstances, this flow thins the film, allowing drop coalescence. Surprisingly, this phenomenon, the so-called relaxation-induced coalescence, is possible even for collisions which would not lead to coalescence while the flow is active, and it thus influences the final drop size distribution of blends/emulsions. In the presence of trace amounts of insoluble surfactants relaxation-induced coalescence is still possible, but less likely, depending strongly on the surfactant diffusivity.

[1] Vannozzi, J Fluid Mech 2012.

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