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Axi-symmetric Marangoni flows in shear-thinning liquids – jets and inner-linings VINEET DRAVID, School of Mechanical Engg., Purdue University, ZHENGJUN XUE, CARLOS CORVALAN, Department of Food Science, Purdue University, PAUL SOJKA, School of Mechanical Engg., Purdue University — This study's objective was to develop analytical models and computational tools for describing, analyzing, and predicting the nonlinear Rayleigh instability of generalized-Newtonian fluids with insoluble surfactant. An Arbitrary Eulerian-Lagrangian finite element method was used to solve the fully two-dimensional equations governing free surface flow and surfactant convective and diffusive transport. Results to be presented here extend our previous research showing that shear-thinning effects facilitate the formation of two-dimensional Marangoni flows that can locally reverse the capillary-induced flow in liquid jets to include the effect of surfactant diffusivity and show the effect of shear-thinning on the nonlinear stability of the inner lining of a capillary. This study's conclusions indicate that two-dimensional Marangoni flows in generalized Newtonian (Carreau) liquids are more complex than previously predicted and depend on chemical and physical properties that can be modulated to ultimately improve flows of industrial and biological significance.

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