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Dynamics of contracting surfactant-covered filaments PRITISH KAMAT, SUMEET THETE, School of Chemical Engineering, Purdue University, QI XU, British Petroleum, OSMAN BASARAN, School of Chemical Engineering, Purdue University — When drops are produced from a nozzle, a thin liquid thread connects the primary drop that is about to form to the rest of the liquid in the nozzle. Often, the thread becomes disconnected from both the primary drop and the remnant liquid mass hanging from the nozzle and thereby gives rise to a free filament. Due to surface tension, the free filament then contracts or recoils. During recoil, the filament can either contract into a single satellite droplet or break up into several small satellites. Such satellite droplets are undesirable in applications where they can, for example, cause misting in a manufacturing environment and mar product quality in ink-jet printing. In many applications, the filaments are coated with a monolayer of surfactant. In this work, we study the dynamics of contraction of slender filaments of a Newtonian fluid that are covered with a monolayer of surfactant when the surrounding fluid is a passive gas. Taking advantage of the fact that the filaments are long and slender, we use a 1D-slender-jet approximation of the governing system of equations consisting of the Navier-Stokes system and the convection-diffusion equation for surfactant transport. We solve the 1D system of equations by a finite element based numerical method.

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