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Thinning of Active and Passive Cylindrical Interfaces Dominated by Surface Forces[1] ALEJANDRO MARTíNEZ-CALVO, ALEJANDRO SEVILLA, Universidad Carlos III de Madrid — Cylindrical interfaces occur in countless natural phenomena and engineering contexts: elongated vesicles are ubiquitous in biological environments, and liquid jets are routinely used for additive manufacturing applications. The most noteworthy aspect of liquid cylinders is the Plateau-Rayleigh instability induced by the interfacial tension. At sufficiently small scales the surface energy associated with the interfacial structure dominate over the volumetric one, leading to phenomena like pearling on vesicles or droplet formation of surfactant-laden threads. Here, by means of theory and numerical simulations we report the existence of an asymptotic regime where interfacial tension balances surface viscous stresses, leading to an exponential thinning of the interface. The potential use of this phenomenon to measure the surface viscosity coefficients will be discussed. Moreover, we will also consider biological and active systems, where other surface and volumetric forces can enter in the dominant balance. We will discuss the effect of surface elastic forces and the role of active stresses that occur beneath the interface in some living systems, namely in the cytokinesis of cells. The outcome of this study may have potential impact in morphogenic processes and developmental studies.

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