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Scaling during capillary thinning of particle-laden drops SUMEET THETE, BRAYDEN WAGONER, OSMAN BASARAN, School of Chemical Engineering, Purdue University — A fundamental understanding of drop formation is crucial in many applications such as ink-jet printing, microfluidic devices, and atomization. During drop formation, the about-to-form drop is connected to the fluid hanging from the nozzle via a thinning filament. Therefore, the physics of capillary thinning of filaments is key to understanding drop formation and has been thoroughly studied for pure Newtonian fluids using theory, simulations, and experiments. In some of the applications however, the forming drop and hence the thinning filament may contain solid particles. The thinning dynamics of such particle-laden filaments differs radically from that of particle-free filaments. Moreover, our understanding of filament thinning in the former case is poor compared to that in the latter case despite the growing interest in pinch-off of particle-laden filaments. In this work, we go beyond similar studies and experimentally explore the impact of solid particles on filament thinning by measuring both the radial and axial scalings in the neck region. The results are summarized in terms of a phase diagram of capillary thinning of particle-laden filaments.

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