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Suppression of Satellite Droplet Formation by Very Dilute Viscoelastic Solutions UDDALOK SEN, TIM SEGERS, Physics of Fluids Group, University of Twente, HERMAN WIJSHOFF, Canon Production Printing B. V. and Department of Mechanical Engineering, Eindhoven University of Technology, MICHEL VERSLUIS, Physics of Fluids Group, University of Twente, DETLEF LOHSE, Physics of Fluids Group, University of Twente and Max Planck Institute for Dynamics and Self-Organization — The presence of satellite droplets during inkjet printing is extremely undesirable since it degrades the quality and reproducibility of the print. Existing strategies for the suppression of satellite droplet formation involve increasing the viscosity of the ink, thus increasing the stability of the jetted filament and suppressing satellite droplet formation. However, such a mitigation strategy is usually at the cost of the jetting velocity. In the present work, we demonstrate that very dilute viscoelastic solutions can suppress satellite droplet formation, without any appreciable loss of droplet velocity as compared to the case with pure water (where satellite droplet formation is observed). Furthermore, we show that, for a given driving condition, there exist upper and lower bounds of polymer concentrations within which satellite droplets are suppressed. Satellite droplets are formed at concentrations below the lower bound, while droplet formation ceases for concentrations above the upper bound. Finally, we attempt to present scaling arguments that shed light on the underlying interplay between inertia, capillarity, and viscoelasticity, which leads to the suppression of satellite droplet formation.

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