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Stability analysis of an electrified liquid jet in the presence of an externally coflowing liquid VENKAT GUNDABALA, VIKRANT MODI, Indian Institute of Technology Bombay, GUNDABALA MICROFLUIDICS GROUP TEAM — Traditionally, electrospinning and electrospray are carried out with either air or vacuum as external medium. Recently, it has been shown that electrospray can be successfully implemented in the presence of an external flowing liquid. We envisage that implementation of electrospinning process in the presence of an external liquid coflowing with the electrospinning solution will allow greater control on the fiber deposition and morphology. In the present work, to gain fundamental understanding on the behaviour of an electrified liquid jet in the presence of an externally coflowing liquid, we perform stability analysis on the system. The classical Rayleigh-Plateau instability and an electrically induced axisymmetric instability were identified. The effect of the viscosity, velocity, and permittivity of the external liquid on the two instabilities was studied. It was found that both the growth rate and the critical wavenumbers were strongly influenced by the above parameters. An operating diagram predicting the transition from drop generation mode to fiber generation mode as a function of external liquid properties is generated.

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