Abstract Submitted
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A numerical study of electrospraying: regime maps and the role of operating parameters[1] AMARTYA VIRAVALLI, AMBATI RAJASHEKAR, NIKHITA JOY, SATYAVRATA SAMAVEDI, HARISH DIXIT, Indian Institute of Technology Hyderabad — Electrospinning/electrospraying is a versatile voltage-driven process used to synthesize fibers/particles in the nano to submicron range from polymer solutions. While different operating regimes (e.g., cone-jet, multi-jet) have been reported before, the effects of system/process conditions on the onset of these regimes and associated transitions are not known. Further, how various process parameters affect cone and jet features of the electrified solution near the needle tip have also not been studied. In this study, electrohydrodynamic simulations are carried out using Comsol Multiphysics for a Newtonian fluid by employing the leaky dielectric model. Parametric studies with these simulations elucidate the effects of solution conductivity, surface tension, flow rate, voltage and throw distance on cone/jet features within specific regimes via simultaneous changes to effective field strength, charge density and field line distribution near the Taylor cone apex. In this talk, we will present simulations and scaling laws in conjunction with experimental data to shed light on electrospinning regimes, associated cone/jet features and operating maps. We believe that these insights can potentially aid real-time control of fiber/particle properties for specific applications.

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