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Electrohydrodynamic simulation of an electrospray in a colloid thruster MANISH JUGROOT, MARTIN FORGET, CECILE MALARDIER-JUGROOT, Royal Military College of Canada — A precise understanding of electrosprays is highly interesting as the complexity of micro-technology (such as nano-material processing, spacecraft propulsion and mass-spectrometers) systems increases. A multi-component CFD-based model coupling fluid dynamics, charged species dynamics and electric field is developed. The simulations describe the charged fluid interface with emphasis on the Taylor cone formation and cone-jet transition under the effect of a electric field. The goal is to recapture this transition from a rounded liquid interface into a Taylor cone from an initial uniform distribution, without making assumptions on the behaviour, geometry or charge distribution of the system. The time evolution of the interface highlights the close interaction among space charge, coulombic forces and the surface tension, which appear as governing and competing processes in the transition. The results from the coupled formalism provide valuable insights on the physical phenomena and will be applied to a colloid thruster for small spacecrafts.

Manish Jugroot
Royal Military College of Canada

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