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The importance of energy dissipation in cone-jets operating in the nanometric regime[1] MANUEL GAMERO-CASTAO, University of California, Irvine — Cone-jets of highly conductivity liquids (electrical conductivity near or larger than 1 S/m) are able to produce sprays of nanodroplets with narrow diameter distributions. This unique ability is of great interest in manufacturing, spacecraft propulsion and hypervelocity impact research. Most of the experimental work in cone-jets has been done under conditions leading to micrometric and larger droplets. Theoretical results have been validated with these data, and are used to guide research in the nanometric regime with the expectation of a valid extrapolation. However, the nanometric regime departs from the micrometric regime due to the increased importance of energy dissipation, which raises the temperature in the fluid and alters properties like viscosity, electrical conductivity, and surface tension (M. Gamero-Castaño, J. Fluid Mech. 662, 493-513 (2010)). These thermal effects have not been considered either in the modelling or in the analysis of experiments, and must be accounted for in order to develop a fundamental understanding of electrospraying in the nanometric regime. This presentation will describe the experimental demonstration of energy dissipation, as well as ongoing modeling work that takes into account this phenomenon.

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