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Periodic emission of droplets from an electrified meniscus A.J. HIJANO, I.G. LOSCERTALES, Universidad de Malaga, Spain, S.E. IBANEZ, F.J. HIGUERA, E. T. S. Ingenieros Aeronauticos, UPM, Madrid, Spain — We report an experimental characterization of the periodic emission of mass from a meniscus hanging from the tip of a needle, fed at a constant liquid flow rate, when subjected to a constant high voltage with respect to a grounded plate. For a given flow rate, the potential is swept until a periodic regime is reached. Two very distinct emission modes are observed to coexist. In each pulsation, the meniscus elongates under the electric field until it develops a conical cusp from which a highly charged fine aerosol is continuously emitted at a very high frequency, resembling the cone-jet electrospray. Simultaneously, the meniscus develops a neck which eventually forms a droplet, much larger than those emitted from the unsteady electrospray. The detachment of the large droplet occurs at frequencies of the order of the inverse of the liquid capillary time, whereas the fine droplets are emitted at much higher, unmeasurable frequencies. For the low viscosity, highly conducting liquids used in this study, most of the mass emitted per pulse is carried by the large droplets, whereas the charge is transported by the fine aerosol. Scaling laws for the dimensionless pulsation frequency and large droplet diameter are provided in terms of an electric Bond number and a dimensionless flow rate.

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