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The incept of ejection from a fresh Taylor cone and subsequent evolution[1] JOSE M. LOPEZ-HERRERA, ALFONSO GANAN-CALVO, ETSI, Universidad de Sevilla, Spain — Within a certain range of applied voltages, a pendant drop suddenly subject to an intense electric field develops a cusp from which a fast liquid ligament issues. The incept of this process has common roots with other related phenomena like the Worthington jets, the jet issued after surface bubble bursting or the impact of a drop on a liquid pool. This is experimentally and numerically demonstrated. However, given the electrohydrodynamic nature of the driver in the formation of a Taylor cone, a number of electrokinetic processes take place in the rapid tapering flow, whose characteristic times should be carefully compared to the ones of the flow. As a result, universal scaling laws for the size and charge of the top drop have been obtained. Subsequently, sustaining the applied electric field, the ejection continues and the issuing liquid ligament releases a train of droplets of varying size and charge. Under appropriate conditions and if the liquid suctioned by the electric field is replenished, the system reaches a (quasi)steady state asymptotically. The degree of compliance of the size and charge of those subsequent droplets with previously proposed scaling laws of steady Taylor cone-jets has been studied. Computational code Gerris and an extended electrokinetic module is used.

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