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Whipping charged jet instabilities within dielectric liquid baths
GUILLAUME RIBOUX, ALVARO G. MARIN, Escuela Superior de Ingenieros, Universidad de Sevilla, IGNACIO G. LOSCERTALES, Escuela Técnica Superior de Ingenieros Industriales, Universidad de Málaga, ANTONIO BARRERO, Escuela Superior de Ingenieros, Universidad de Sevilla — Capillary liquid flows have shown their ability to generate micro and nano structures of interest in several technological fields. Most of these techniques resort to deforming and stretching a liquid thread by applying forces of different nature (hydrodynamic, electrical, etc). Electrospray, employing electrical forces, is the most popular and powerful technique to produce particles in the nanometric range. A charged liquid jet issued from a Taylor cone may develop a special type of nonaxisymmetric instability which manifests itself as a series of fast and violent lashes of the charged jet. Recently, we have found that this instability is also present in electrosprays within a liquid bath which is essentially the same phenomenon as in air. However, within a liquid bath, the jet forms more easily and its oscillations are much slower. Taking advantage of this situation, we have used a high speed camera to experimentally characterize the whipping instability taking place inside liquid baths in terms of the governing parameters: flow rate and applied electric field.

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