

Fundamentals and Applications for electrohydrodynamics

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Abstract—Electrohydrodynamics is the study of the complex relationships between electricity and liquid flows. Electrohydrodynamics is not a new research area. The first experiment was realized by Michael Faraday in 1838. In a popular article published in the Philosophical Transactions of the Royal Society, he reported that when “two wires be dipped into a pint of turpentine oil in different places one leading to an electrical machine and the other to the discharging train on working machine, the fluid be thrown into violent motion throughout its whole mass”. This experiment seems to be simple but it took over a century to fully explain the phenomenon. However the first application was imagined only fifty years later by Lord Rayleigh. In 1882 he predicted the maximum amount a charge that a droplet of liquid could carry. Then electric charge can be used to atomize liquid droplets. For the last forty years researchers have worked on fundamental problems in order to better understand and to well model the EHD phenomena. EHD could appear to be only fundamental but since few years a lot of applications start to be developed : nano particles and nano fibers production, Lab on ship, new screen technology, zero gravity cooling systems for mars spaceship, robot muscle ... and that is very promising.