

Abstract Submitted
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The Microfluidic Thunderstorm ALVARO G. MARIN, WIM VAN HOEVE, Physics of Fluids, Univ. Twente, LINGLING SHUI, JAN C.T. EIJKEL, ALBERT VAN DEN BERG, Bios/lab-on-chip group, Univ. Twente, DETLEF LOHSE, Physics of Fluids, Univ. Twente — The so-called “Kelvin’s thunderstorm” is a simple experiment demonstrating the spontaneous appearance of induced free charge in droplets emitted through a tube. As Lord Kelvin explained, the droplets acquire a net charge spontaneously during pinch-off due to the presence of electrical fields in their surrounding created by any metallic object. In his experiment, two streams of droplets are allowed to drip from separated nozzles into separated buckets, which are at the same time interconnected through the dripping needles. The implementation of such an effect in a microfluidic device could enhance the control of droplets and prevent undesired effects as coalescence. The phenomenon has been successfully reproduced in a simple microfluidic device, where the droplets could get charged to charge-to-mass ratios above the Rayleigh limit. Experimental measurements will be presented showing the dependence of the acquired charge in the droplets on different parameters as the flow rate or the liquid electrical conductivity. The concept certainly opens a door to a costless and accessible transformation of pneumatic pressure into electrical energy and to an enhanced control in microfluidic technologies.

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