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Transport of nonconductive and conductive droplets in a parallel plate array DEBALINA CHATTERJEE, Biomedical Engineering Interdepartmental Program UCLA, BOONTA HETAYOTHIN, AARON WHEELER, DANIEL KING, ROBIN GARRELL, Chemistry and Biochemistry UCLA — Electrowetting on dielectric technique is used to actuate conductive liquid droplets on electrodes patterned beneath a dielectric. Nonconductive liquids can be transported electrohydrodynamically inside channels. We show for the first time that it is possible to transport droplets of nonconductive liquids on dielectric surfaces, using modest voltages and frequencies (<100 V, <10 kHz). Ionic liquids, aqueous surfactants, buffers, and organic solutions can also be transported. Although conductive liquids show a significant change in liquid contact angle on application of potential, nonconductive liquids do not, suggesting a different mechanism of transport. The empirical criteria for moving droplets in a two-dimensional array are a liquid dielectric constant ≥ 4.3 and a molecular dipole moment ≥ 1.2 D. The transport mechanisms are discussed along with new microfluidic applications that these results suggest are now feasible.

Debalina Chatterjee
Biomedical Engineering Interdepartmental Program UCLA

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