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Electroosmotic micro-pump array for local control of droplets. AMIT GUPTA, AMIR HIRSA, DIANA-ANDRA BORCA-TASCIUC, Rensselaer Polytechnic Institute — Droplet-based microfluidic devices have a wide range of applications in various fields such as diagnostics and clinical testing, drug delivery and opto-electronics. This paper presents a novel microfluidic device for actuation and control of individual droplets employing electroosmotic pumping across a nanoporous membrane. To fabricate the device, arrays of gold electrodes pairs are first patterned on both sides of an anodic alumina membrane (Whatman, $\sim$50 μm in thickness, with parallel cylindrical pores of 150 nm in diameter). One side of the membrane is then attached to a liquid reservoir while the other side is covered partially with Teflon to prevent droplet spreading. When voltage is applied between the two aligned top and bottom gold electrodes electroosmotic flow occurs from the liquid reservoir through the membrane and a droplet forms onto the Teflon-coated surface of the membrane. Actuation time and droplet shape are investigated by video microscopy in order to assess the effect of electrode configuration and electrolyte ionic strength Possible applications for the device include addressable liquid microlens arrays, fast-response droplet switches and fast, sample collection devices for brain microdialysis.

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