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Cost effective fabrication method for microscaled interdigitated electrodes for fast 3D ACEO pumps YEHYA SENOUSY, CINDY HARNETT, University of Louisville — Electro-osmotic pumping is a promising battery-powered replacement for traditional pumping systems at the micro scale when dilute electrolytes are used. To avoid the drawbacks of pumping using DC, "ac electro-osmotic" (ACEO) pumps have been recently introduced. The advantages over DC electro-osmotic pumps include lower operating voltages at integrated electrodes, and absence of gas generation from electrolysis. The microchannels of these ACEO pumps consisted first of asymmetric, planar electrodes. A non-planar ACEO pump geometry was then introduced with electroplated three dimensional (3D) stepped electrodes. This design had a faster flow rate than the planar ACEO pump by an order of magnitude, but the fabrication process was complex. In this paper, we demonstrate a new fabrication method for these 3D interdigitated microelectrode arrays. The method eliminates the need for electroplating thick 3D electrodes; instead 3D interdigitated electrodes are created by shadow evaporation of thin films on 3D structures that could be injection molded. The pumps were characterized for flow speed versus applied voltage amplitude and frequency.

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