

Electronic Supplementary Information

Video 1:

The video of water pumping in silicone oil by DEP along a 100 μm -wide and 50 μm -high ($\text{AR} = 0.5$) microchannel. 100 kHz signals from 70 Vrms to 180 Vrms were applied between the blank ITO electrode on the top plate and the patterned linear electrode on the bottom plate. One captured image at 70 Vrms is shown in Fig. 2(a).

Video 2:

The video of water pumping in silicone oil on a tapered electrode by applying an 80 Vrms and 100 kHz signal as shown in Fig. 3(a). When the voltage was removed from the tapered electrode, water was drawn back to the reservoir by EWOD.

Video 3:

The video corresponding to Fig. 4, pumping water on a meandered electrode. The video is played at a 3x speed.

Video 4:

The video of particle solution pumping in silicone oil on a meandered electrode. Polystyrene beads at the concentration of 4.2×10^8 particles ml^{-1} were found concentrated at the spacing of the electrode by negative DEP.

Video 5:

The video of water filling and draining of the spacing between the virtual microchannel by adjusting the liquid pressure at the reservoir through different EWOD voltage.