

## **Lab on a Chip**

### **Electronic Supplementary Information**

**Title:** Scaled particle focusing in a microfluidic device utilizing induced-charge electroosmosis

**Authors:** Yukun Ren,<sup>\*ab</sup> Jiangwei Liu,<sup>a</sup> Weiyu Liu,<sup>a</sup> Qi Lang,<sup>a</sup> Ye Tao,<sup>a</sup> Qingming Hu,<sup>a</sup> Likai Hou<sup>a</sup> and Hongyuan Jiang<sup>\*ab</sup>

*a. School of Mechatronics Engineering, Harbin Institute of Technology, West Da-zhi Street 92, Harbin, Heilongjiang, PR China 150001.*

*b. State Key Laboratory of Robotics and System, Harbin Institute of Technology, West Da-zhi Street 92, Harbin, Heilongjiang, PR China 150001.*

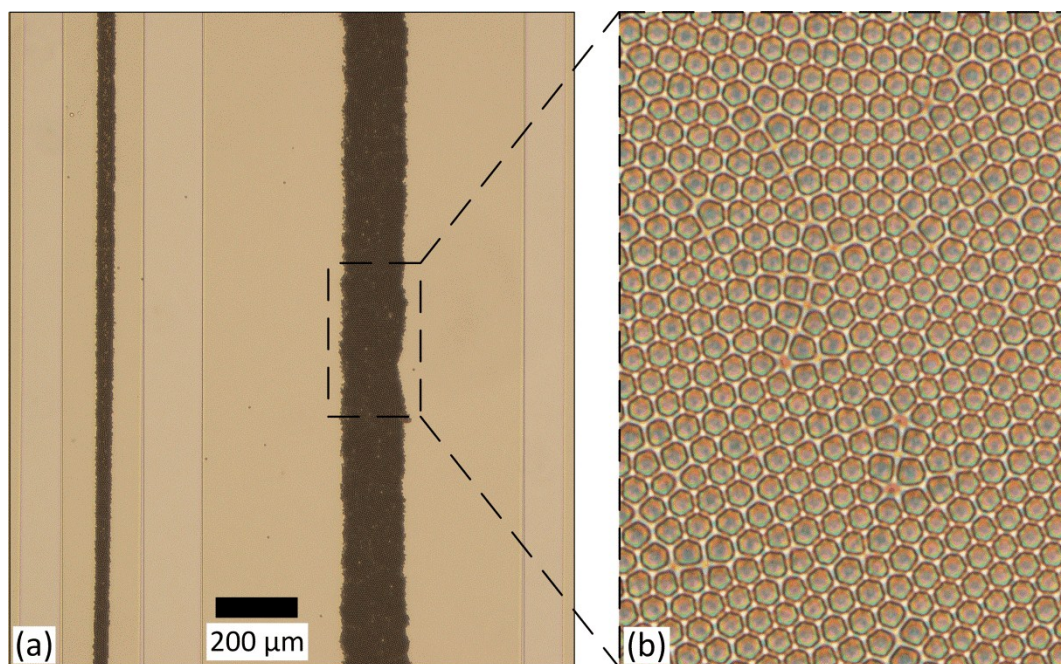


Fig. S1 Particles crowding in one plane without blockage.

While scattered particles were trapped into a compact stream of particular width, particles lay flat on the floating electrodes without mutual overlap as shown in Fig. S1.

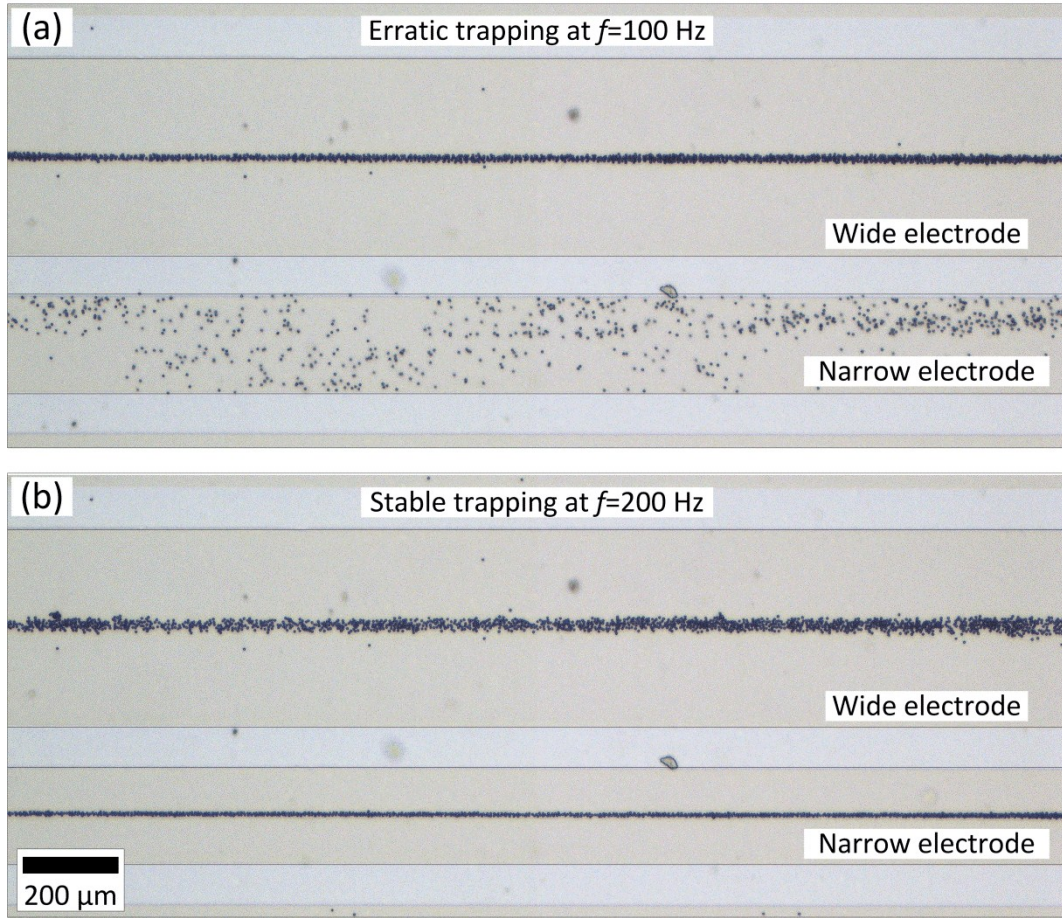


Fig. S2 Particle trapping in device S-2: (a) at frequency  $f=100$  Hz (erratic); (b) at frequency  $f=200$  Hz (stable).

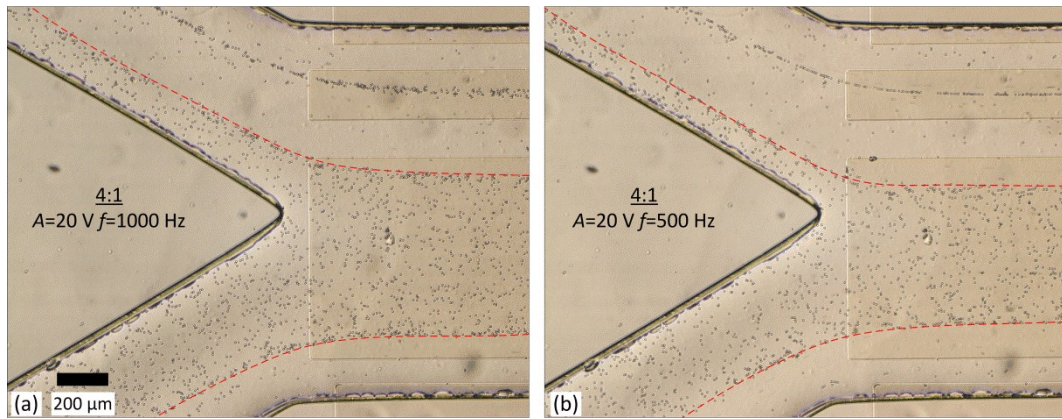


Fig. S3 Particle leakage in device F-4: (a) at frequency  $f=1000$  Hz; (b) at frequency  $f=500$  Hz.

Particle leakage phenomenon occurs on flow focusing devices when the electrode width ratio is above 2:1.



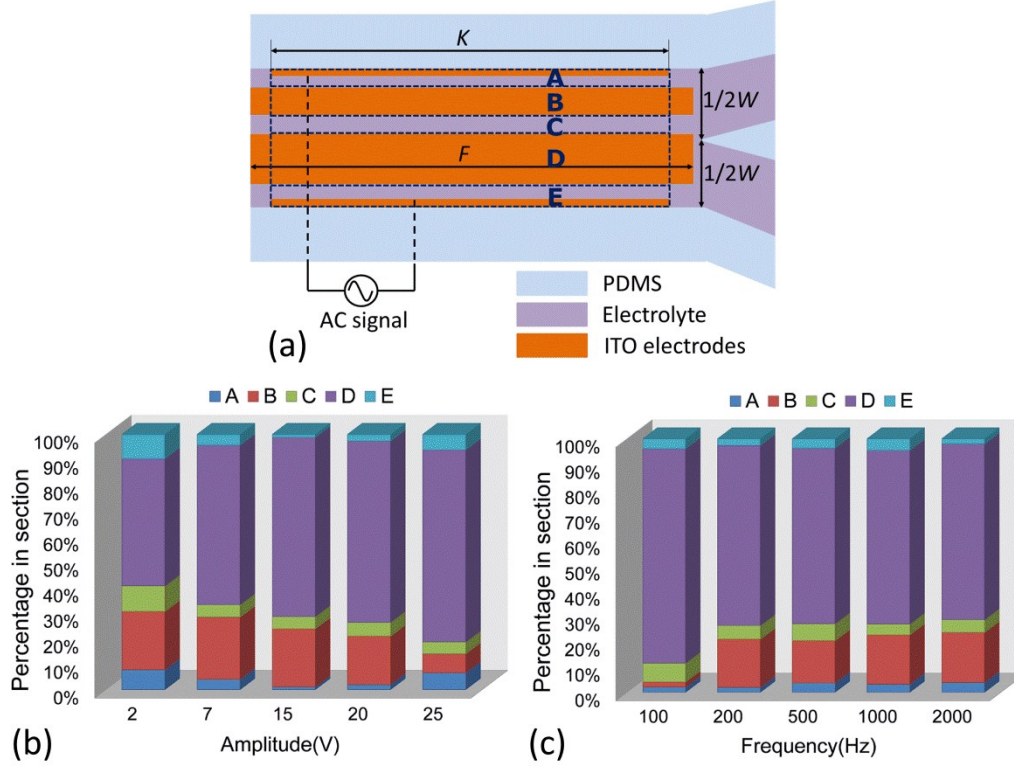


Fig. S4 (a) The statistical area is partitioned by the five blue rectangles A, B, C, D and E. (b) and (c) are the histograms for particle number in an area as a percentage of particle number in the entire main channel on device F-3 at different voltages and frequencies, respectively.

We statistically counted the number of particles in the five distinct areas, marked by five blue rectangles in Fig. S4(a). Histograms are given in Fig. S4(b) and (c). Experimental results on particle sample distribution again demonstrate an appropriate voltage amplitude of 15~20 V and frequency of 200 Hz, where most particle samples (90%) are concentrated on both floating electrodes by ICEO (areas B and D), whereas less than 4.5% appear on the driving electrodes by ACEO (areas A and E) and less than 5.5% stay in the gap between the two floating electrodes (area C) which flow out directly before collection by nonlinear electroosmosis. Exceeding this valid range,  $FR_F$  is not be expected as  $L_2/L_1$ , in that a lower (higher) voltage or a higher (lower) frequency leads to a weakened (enhanced) ICEO flow rate, and  $FR_F$  tends to decrease (increase) with respect to  $L_2/L_1$ .