Supplementary Information (SI) for Lab on a Chip.
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Supplementary Information

Reusable EWOD-based microfluidic system for active droplet generation

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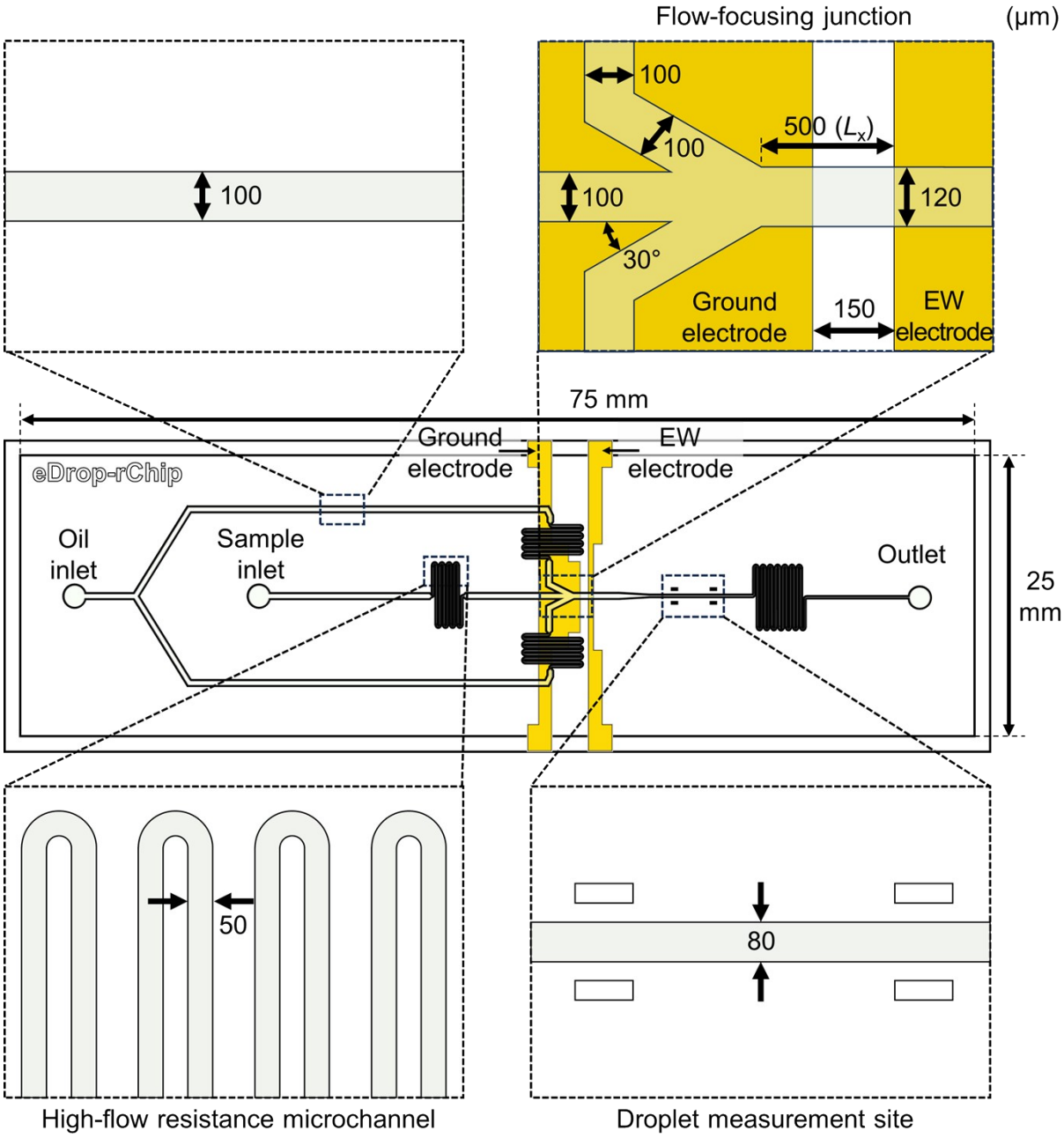

Fig. S1 Design of the eDrop-rChip for actively controlling droplet generation. The device consists of the ground and EW electrodes to generate droplets through the electrowetting force, three microchannels with high-flow resistance to stabilize oil and sample flow, and a flow-focusing junction with a 120 μm-wide droplet microchannel.

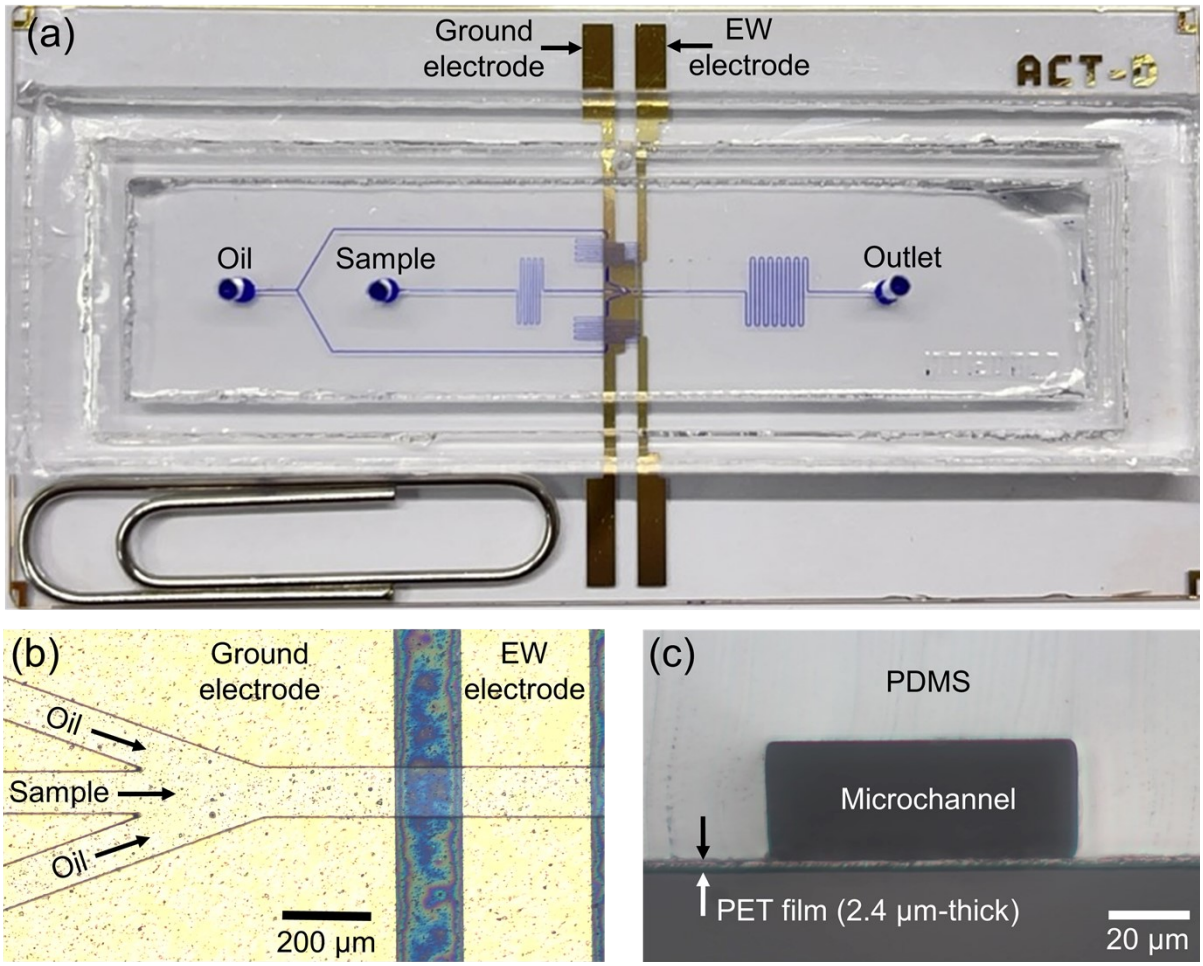

Fig. S2 Photographs of the fabricated eDrop-rChip. (a) Overview of the device, showing the ground and EW electrodes, the flow-focusing junction for droplet generation, and the droplet microchannel. (b) Close-up of the ground and EW electrodes and the flow-focusing junction, displaying the two oil microchannels injected from both sides into the sample microchannel. (c) Microchannels formed between the PDMS replica and the 2.4 μm-thick PET film.

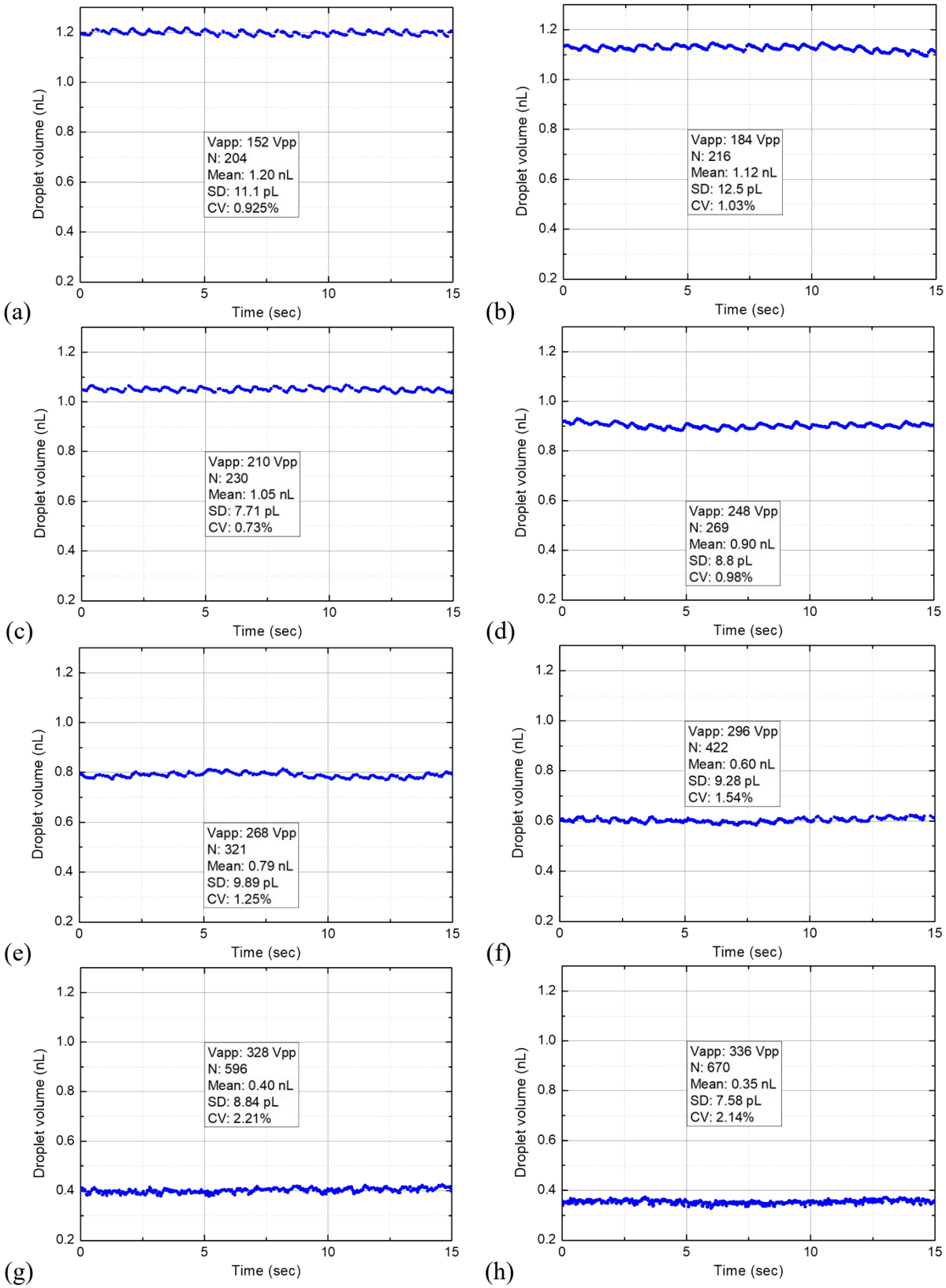

Fig. S3. Sizes of droplets generated by the EW force at applied voltages of (a) 152, (b) 184, (c) 210, (d) 248, (e) 268, (f) 296, (g) 328, and (h) 336 V_{pp}. As the applied voltage increased, the droplet size gradually decreased from 1.2 to 0.35 nL, while the CV of the droplet volume increased from 0.73% to 2.21%.

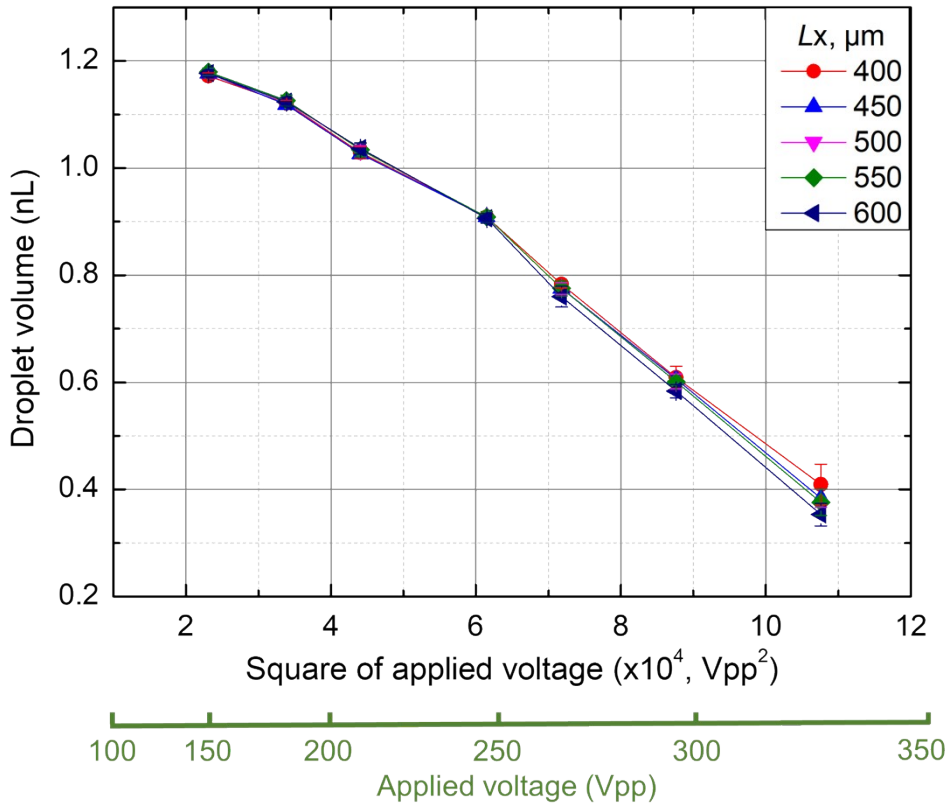

Fig. S4. Variation in droplet volume with the distance L_x between the flow focusing junction and the EW electrode. The results show that droplets are produced at a constant size when the distance is within 100 μm around 500 μm. Therefore, the alignment tolerance to the microchannel direction is approximately 100 μm.