Supplementary Material

Transport of Live Yeast and Zebrafish Embryo on a Droplet ("Digital") Microfluidic Platform

Sang Uk Son[1] and Robin L Garrell*

Department of Chemistry and Biochemistry and California NanoSystems Institute,
University of California Los Angeles, CA 90095-1569

Gap Control Device

In a two-plate digital microfluidic device, reducing the gap between the top and bottom plates increases the force acting on the droplet and hence the resulting velocity. Typically, tape is used to control the gap height, but small gaps and continuous variation of the gap cannot be achieved this way. A digital micropositioner (Thorlabs DM713) makes it possible to vary the gap continuously with 0 to 25 mm range and ±2 μm resolution. This apparatus enables the gap to be maintained at less than 50 μm to slow droplet evaporation, enable manipulation of smaller droplets, and lower the voltage needed for actuation.

Illustrations of the experimental apparatus and gap control device are shown in Figure S1. Two parallel posts support the top plate and cantilever clips are used to affix it firmly. The whole body, including the top plate and clips, is moved vertically with a digital micropositioner. The post levels are adjusted with an angle rotator. Gap calibration is achieved by lowering the top plate and measuring resistance change between the base, conductive material, and top plate with a multimeter. A micropositioner is used to lift the cover glass vertically while the device is held on a fixed base by a vacuum chuck. The desired gap is obtained by manually adjusting a digital-readout micropositioner. The gap height is calibrated by moving the cover glass towards the base; current flow is detected upon contact. The cover glass is then lifted a distance equal to the device thickness to make the gap between the device and the cover glass become zero.

[1] Present address: Samsung Techwin Co., Ltd, Digital Solution R&D Center, Nongseo-dong, Giheung-gu, Youngin, Gyunggi-do, Republic of Korea

*Author to whom correspondence should be addressed.
E-mail: garrell@chem.ucla.edu
Fax: +1 (310) 206-2061, Tel: +1 (310) 825-2496

Figure S1. Schematics of the experimental set-up and gap controller. The gap between the bottom plate of the device and the cover glass is adjusted by moving the cover glass, which is attached to a micropositioner with clamp and support.