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Electronic Supplementary Information

Droplet-in-oil array for picoliter-scale analysis based on sequential-inkjet printing

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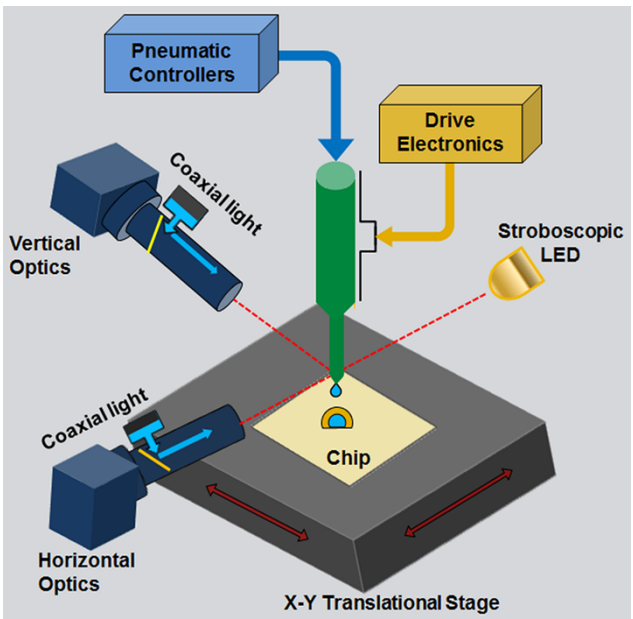

Fig. S1 Schematic diagram of inkjet-printing platform. This printing system consisted of three major components: (1) Inkjet-dispensing device was coupled with pneumatic controller and drive electronics. It could be controlled by software to adjust different parameters of droplets, including velocity, volume and frequency. (2) A stroboscopicoptics subsystem was designed to observe formation and trajectories of droplets in flight with the assistance of a pulsed LED for illumination. Horizontal and vertical optics subsystems, which were coupled with coaxial light, were designed to ensure accurate alignment of nozzle orifice for reagent injection with the center of preprinted oil droplets on substrates. (3) X-Y translational stage was assembled in perpendicularly crossing way from two liner displacement stages (M406.4PD, PI, Germany) with minimum incremental motion 0.25μm and maximum velocity 15 mm/s. The planar substrate or chip were fixed on the two-dimentional translation stage. With our limited inkjet-printing nozzle, in the enzyme inhibition experiment, we actually used the same printing tip for different samples. Before changing DTPA concentrations, we use buffer and DI water to wash the tube and printing nozzle in order to avoid cross-contamination.

Movie S1. Video showing the typical process of two-step sequential-inkjet printing.

Preliminary data	M-406.4PD	Unit
Motion and positioning		
Travel range	100	mm
Integrated sensor	Rotary encoder	
Sensor resolution	4000	cts./rev.
Design resolution	0.125	μm
Min. incremental motion	0.25	μm
Unidirectional repeatability	0.2	μm
Backlash	1	μm
Crosstalk, angular error	±50	μrad
Max. velocity	15	mm/s

Fig. S2 The technical information of translation stage, M406.4PD (Physik Instrumente, Germany).

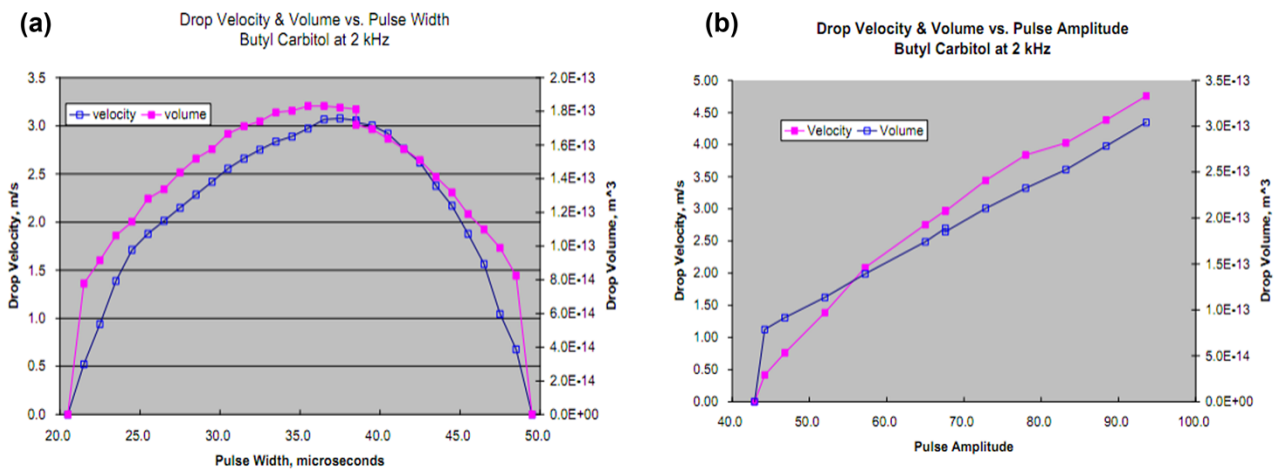

Fig. S3 The performance measurement results of Jetlab®4 inkjet platform given by MicroFab. Note that the droplet velocity was direct portion to pulse width (a) and amplitude (b).

