Electronic Supplementary Material (ESI) for Lab on a Chip.

Characterisation of hydrodynamic trapping in microfluidic cross-slot devices for high strain rate applications

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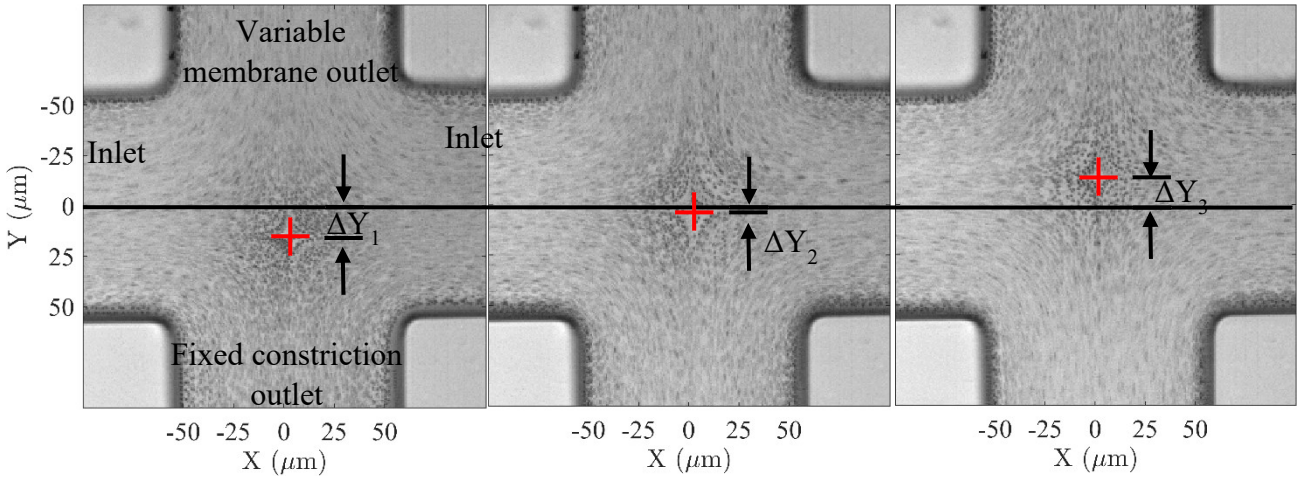
Experimental characterisation of hydrodynamic trapping of a particle in cross-slot microfluidic devices for high strain rate applications were achieved through real-time image-segmentation linear feedback control technique. Our investigations reveal that the maximum attainable strain rate in such devices is a function of the time delay of the algorithm along with the particle resolution. Here, in this supplementary article, additional details are reported which were observed and estimated during the measurement analysis.

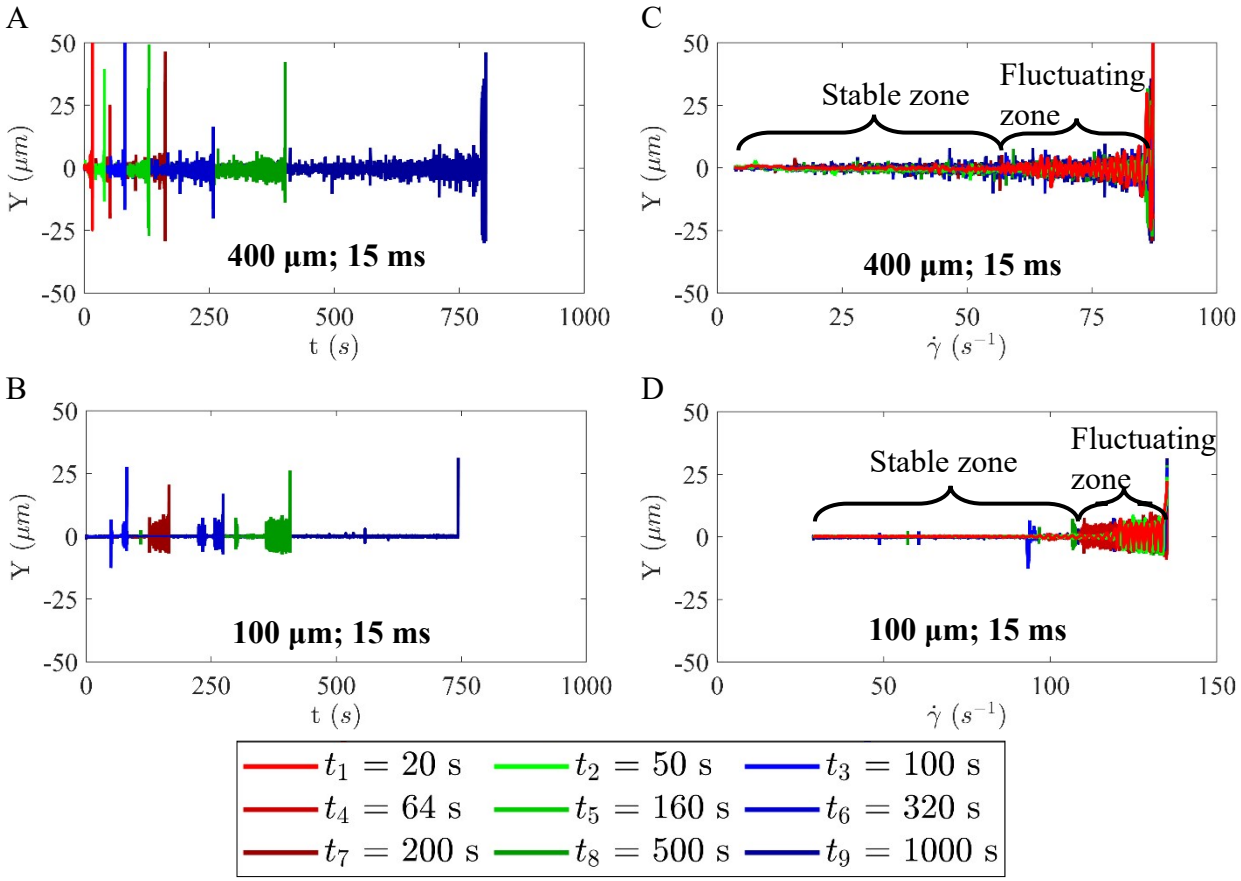
Supplementary figures

The supplementary figure 1 illustrates the calibration of 100 μm width cross-slot channel i.e., by locating all the stagnation points corresponding to different actuation pressures applied through the control channel.



Supplementary Figure 1 Overlaid images of flowing particles showing different stagnation positions for 100 μm width cross-slot channel.

The supplementary figure 2 illustrates the ramp cases of high strain rate measurements carried out in 400 μm and 100 μm widths of cross-slot channel at a time delay of 15 ms. Both the channels experience the maximum stable strain similar to the step cases illustrated in the Fig. 4e and 5e (main article).



Supplementary Figure 2 Measurements of high strain rate hydrodynamic trapping of a 5 μm particle in different cross-slot channels at a time delay of 15 ms (or 66 Hz): A, B] Positional confinement of the particle trapped at the stagnation point at different time scales for the ramp cases; C, D] Stable and fluctuation zones of the trapped particle at the stagnation point at varying strain rates corresponding to different time scales

Supplementary movies

Movie 1 and Movie 2 illustrates trapping of 5 μm particle at the stagnation point in the 400 μm and 100 cross-slot channels, respectively.

Movie 3 and Movie 4 illustrates trapping of red blood cell at the stagnation point in the 400 μm and 100 cross-slot channels, respectively.

Movie 3: High strain rate experiment of the 5 μm trapped particle in 100 μm cross-slot channel at a time delay of 4 ms. This movie is the step case of t_1 = 20 s (Fig. 7 d and e). Particle escapes from the trap centre when the strain rate exceeds 250 s^{-1}.