Electronic Supplementary Material (ESI) for Lab on a Chip

SUPPLEMENTARY FIGURES

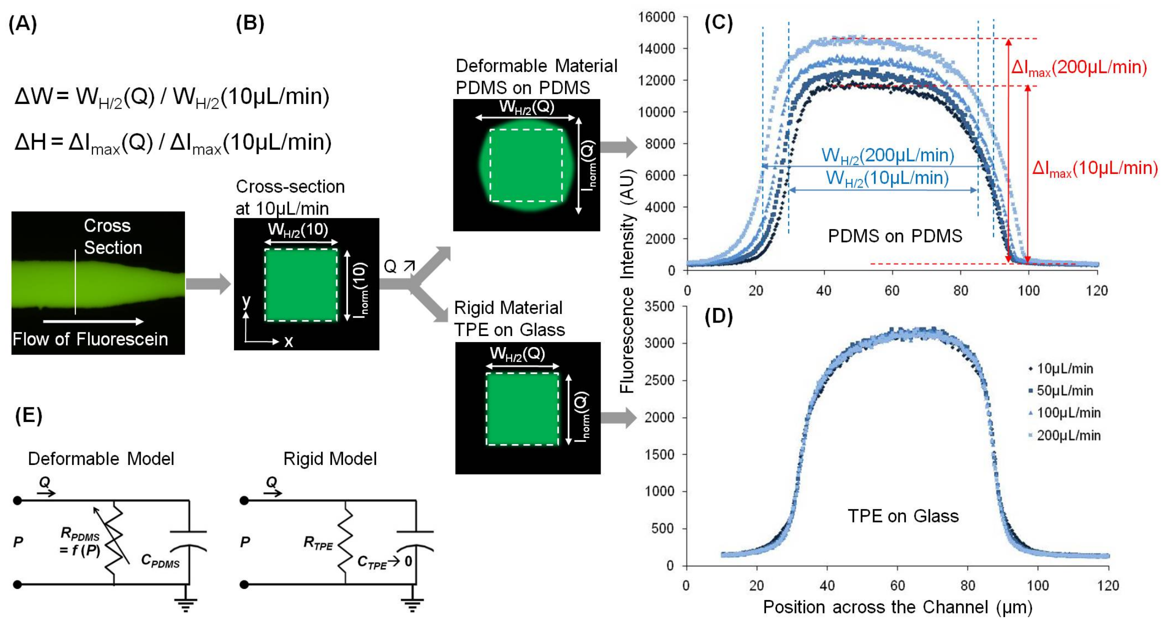

Figure SI.1: Technique used to characterize channel deformation with increasing flow rate. (A) Fluorescein is injected at different flow rates and the intensity profile is plotted at a constant exposure time for cross-sections normal to the flow direction. (B) Schematic representation of channel cross-section and deformation for increasing flow rate. For PDMS on PDMS channels, hydrodynamic pressure results in a cross-sectional area increase in both the X and Y directions, which leads to a change in the intensity profile (C) compared to 10 μL/min. For more rigid TPE channels, increasing pressure does not lead to appreciable deformation of the cross-sectional area, so that the intensity profile is not altered by changing flow rate (D). Relative depth (*ΔH*) and width (*ΔW*) changes can be defined as the normalized expansions in X and Y axis respectively, considering there is no deformation at 10 μL/min. (E) A schematic of a simplified RC model for deformable (like PDMS) and rigid (like TPE) chips. Flow (*Q*) is driven into the channel where the fluidic resistance (*R*) and compliance (*C*) result in particular pressure flow relationships. For deformable channels, the resistance is dependent on the pressure and the compliance has a significant effect on the flow. On the contrary, rigid channels have a constant resistance while the compliance, several orders of magnitude lower than for PDMS, has little effect. As the compliance goes to zero, the compliance branch becomes an open circuit and the pressure flow relationship becomes the simplified $\Delta P = RQ$.

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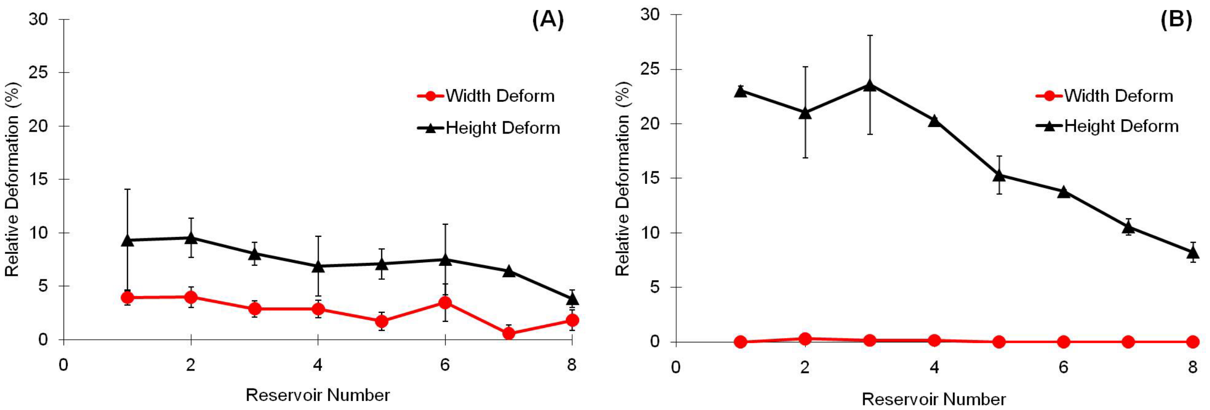

Figure SI.2: Effect of material deformability on changes in channel height and width for vortex microchanels. Experiments were conducted at 400µL/min for a PDMS chip bonded to glass. (A) Width (●) and height (▲) deformation versus the position along the microchannel measured just before each enlargement/reservoir. (B) Width (●) and height (▲) deformation versus the position along the microchannel measured within each reservoir. Note that closer to the channel outlet, the pressure decreases which corresponds with decreasing channel deformation.