

Article

CO₂ Laser-based Rapid Prototyping of Micropumps

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1. Supplementary Data

2 1.1. Figure S1: Dry Channels and Droplets Moving Within an Oil-Sheath

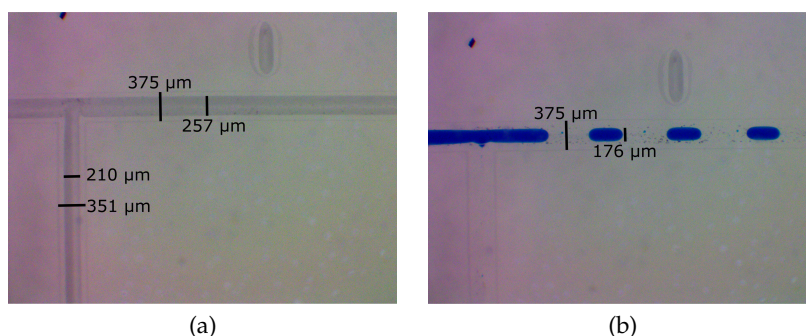


Figure 1. (a) An image of the fabricated chip near the T-intersection prior to any contact with liquid. The slight astigmatism of the laser beam is seen here, producing slightly different channel profiles in the horizontal and vertical directions. In either case two widths are shown, the larger due to the heat-affected zone and the smaller due to the channel itself. (Please note that these images are rotated by 90 degrees from the image of Fig. S1a.) (b) A photograph of the droplets being moved along the channel. The larger width is again due to the heat affected zone, but the small difference in the refractive indices of the oil and PMMA makes the channels difficult to resolve. The smaller width is now the width taken up by the droplets.

1.2. Figure S2: Droplets In a Zig-Zag

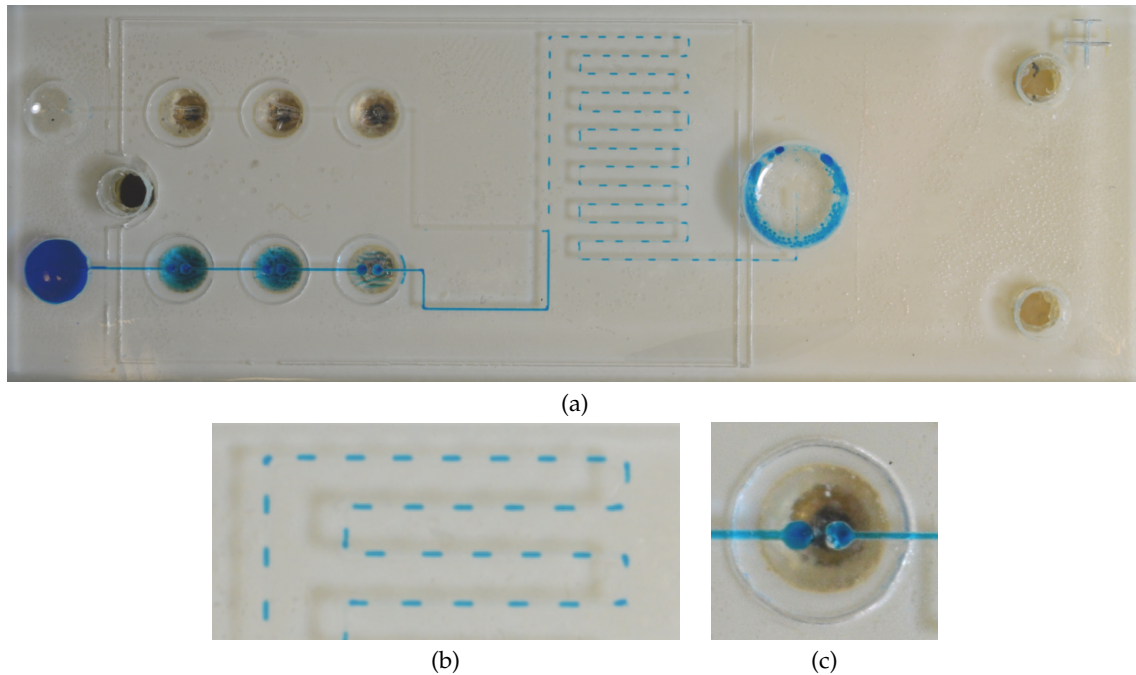


Figure 2. (a) Under the conditions of minimal backstep, the chip (Fig. 1c) generates a uniform train of droplets of water (blue) in oil (clear) that are drawn from the oil and water reservoirs on the left and marched through a complex structure to a waste well on the right. Not shown in Fig. 1c are the alignment holes (two on the right and one on the left). The chip is 76.2×25.4 mm and underneath are the 6 brass fittings screwed into the base of the chip, each connecting to an output from the pneumatic controller, which is in turn controlled via a laptop computer. (b) The top of the zig-zag structure is shown in higher resolution, with a shadow of the channel in the background. (c) Although the bottom right valve in (a) shows wrinkles in the membrane [from deformation under excessively large pressure differences] and some leakage into the moat around the valve, these defects are not apparent in the corresponding valve from a chip used only under the optimal pressure conditions. The brown shading is from the brass fitting that is attached underneath the chip.