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Two dimensional microfluidic devices for sorting, mixing, and analyzing drops using superhydrophobic surfaces MICHAEL NILSSON, HRISTO GOUMNEROV, JONATHAN ROTHSTEIN, University of Massachusetts Amherst — The effect of sharp transitions in contact angle hysteresis of a superhydrophobic surface on water droplet motion is investigated. The surfaces are created by sanding naturally hydrophobic Teflon, which results in a surface possessing microscale roughness. With careful sanding and masking of the surface, regions with similar advancing contact angles near 150 degrees but varying contact angle hysteresis can be created. This talk presents detailed results on how these sharp transitions can deflect drops when the transition is at an angle to the droplet trajectory. The physics of the droplet-transition interaction is discussed and the sensitivity of the alignment of the angle of transition and Weber number is presented. Deflection using an angled transition in contact angle hysteresis is selective, demonstrating the ability of this fabrication method to sort drops based on size, speed, and wettability. Results of surfaces with stripes of different contact angle hysteresis are presented, showing the ability to more effectively deflect. Finally, a two-dimensional droplet reactor is presented that encompasses droplet sorting, coalescence, mixing, and trapping of two droplets.

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