

Droplet-based microfluidic photomasks for fabricating various controllable patterns

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Micro-patterned structures are applicable in sensing, bio-application, etc. Widely used method to fabricate micro-patterned structures is a photolithography. In a photolithography, opaque plate with holes or transparencies called photomask is used. Although conventional film type photomask is powerful tool for fabricating patterned structures, it would not be possible to manipulate the size or arrangement of photomask design in real time. Herein, we report droplet-based microfluidic photomasks for fabricating various patterns with on-demand control. Oil in water monodisperse emulsions were generated with high throughput. Generated emulsions were hexagonally close-packed in the reservoir of the device. Spatially selective penetration of ultraviolet (UV) light was possible because of dissolved water-soluble UV absorbing dye. Selective penetrated UV light ensured the selective crosslinks of the photoresist lying beneath the reservoir. Therefore, micro-patterned structures were fabricated by exposing UV light to the photoresist film passing whole device. By adjusting the flow rates of the fluids, the size and arrangement of droplets were easily tuned. We expect that the photomasks can reduce the cost and time for fabricating various patterns.