

System for droplet trapping using pneumatic valves in microfluidic device

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Droplets in microfluidic devices have many interest due to high monodispersity, precise control of droplet size, and transportation of chemical or biological materials. Among many applications using droplets such as synthesis of functional materials or protein crystallization, assay of bio-substance in microfluidic system is widely used. However, it is difficult to detect or observe dynamic process within moving droplets. Therefore, technique for trapping droplets at fixed position in microchannel is important.

In this study, we developed a novel system about droplet trapping using pneumatic valves. The thin pneumatic valves were made of PDMS elastomer. Therefore, modification of their shape happened easily by flow pressure. In other words, by flow pressure, the pneumatic valves were lifted to the inside of control channel. So, the height of the valve region was higher relatively. At the valve region, moving droplets generated at the flow focusing region could be trapped for more stable state. Furthermore, trapped droplets could be released by applying the pressure at the valves.