

Generation of Water Droplets by Using Valves in Multilayer Microfluidic Chip

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Microfluidic systems became to useful platforms in many research areas including chemistry, material science and pharmaceuticals because of their easy fabrication and precise controllability. Especially, emulsion droplets in microfluidics are taking a growing interest as chemical reactors or confining geometries of self-assembly. However, although hydrodynamic focusing channel in single layered fluidic chip can make monodisperse droplets, they can not provide in situ control of droplet size and inter-droplet distance.

In this study, we fabricated the multilayered microfluidic chips with pneumatic valves for unrestricted droplet generation. Using the pneumatic pumps, control channel could act as a valve of water flow and water droplets could be generated in oil phase by controlled on-off time. Therefore, programmed valve action can induce sequential fabrication of droplets we want. Droplets generated by this programmable scheme will be a good tool in chemical and biological application.