

Integration of Magnetoresponse Microspheres into Microfluidic System for Pumpless Fluid Handling

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Fluid handling is a key element in the performance of microfluidic “lab-on-a-chip” system. Although many microfluidic devices have been developed for various applications, most of such devices require complicated and large mechanical instruments for controlling solutions. Herein, we integrated magnetoresponse microspheres into the microchannels for pumpless fluid handling. An array of magnetoresponse microspheres in consecutive rows of microchannels could be developed by trapping of emulsion droplets including iron oxide nanoparticles, which were subsequently photopolymerized under external magnetic field. Due to the net magnetic moments, microspheres could be rotated under the external magnetic field. It was possible to control the velocity or direction of fluid by changing the rotational motion of microspheres. Moreover, immediate shift of flow direction could induce the mixing of fluids in microchannels.