

Quantitative analysis of swelling of PDMS (polydimethylsiloxane) elastomer in silicone oil

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The ECD (electrophoresis of charged droplet) system is drawing attention as an actuation method of droplet in digital microfluidic systems. A droplet-based microfluidic system with multiple electrodes needs hydrophobic surface to avoid droplet attachment. With many advantages, PDMS (polydimethylsiloxane) is used as hydrophobic surface and silicone oil is used as surrounding fluid. However, PDMS absorbs hydrophobic molecules and it swells. This swelling causes problems not only in ECD system, but also in micro-channels of microfluidic system. So many researches have been performed to find alternatives of PDMS like PFPE, PMMA, COC, and TPE. But those materials have problems such as difficulty in fabrication and high-price. Moreover PDMS has been researched for longer time than those materials. So, in the present work, a quantitative analysis has been performed to find an optimal condition of PDMS preparation for minimum swelling. More specifically, the effects of the curing agent and the silicone oil viscosity have been studied extensively.