PDMS microfluidic-chip fabrication and flow visualization of electrokinetic transport of colloidal suspension

전명석[1,*], 문재석[2,1], 임종주[2]
[1]한국과학기술연구원 Complex Fluids Lab.;
[2]동국대학교 생명화학공학과
(mschun@kist.re.kr*)

Understanding electrokinetic microflow plays an essential role in the research of lab-on-a-chip aiming bio-analysis processes. Utilized the MEMS process, various types of rectangular flow channel with high-aspect-ratio were designed and fabricated with polydimethylsiloxane (PDMS) to allow for fluorescent microscope visualization. Moving fluorescent model latexes result in image streaks, where the latex concentration is sufficiently dilute underlying the condition of simple fluid. Applying the particle streak imaging, the linear velocity of charged particle at the lateral position of the channel was favorably determined. The velocity profile of colloidal suspension depends obviously on the surface properties of the channel wall, where the velocity is reduced with increases in the surface potential. The reliability of the velocity profile determined by the flow imaging is justified by providing the finite difference solution as well as comparing with the measured flow rate. We recognized the behavior of Navier's fluid slip at the hydrophobic PDMS wall and then estimated the slip length inferred from experimental results.