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Instantaneous velocity measurement of AC electroosmotic flows by laser induced fluorescence photobleaching anemometer with high temporal resolution WEI ZHAO, FANG YANG, Department of Mechanical Engineering, University of South Carolina, Columbia, RUI QIAO, Department of Mechanical Engineering, Virginia Tech, GUIREN WANG, Department of Mechanical Engineering & Biomedical Engineering Program, University of South Carolina, Columbia, RUI QIAO COLLABORATION — Understanding the instantaneous response of flows to applied AC electric fields may help understand some unsolved issues in induced-charge electrokinetics and enhance performance of microfluidic devices. Since currently available velocimeters have difficulty in measuring velocity fluctuations with frequency higher than 1 kHz, most experimental studies so far focus only on the average velocity measurement in AC electrokinetic flows. Here, we present measurements of AC electroosmotic flow (AC-EOF) response time in microchannels by a novel velocimeter with submicrometer spatial resolution and microsecond temporal resolution, i.e. laser-induced fluorescence photobleaching anemometer (LIFPA). Several parameters affecting the AC-EOF response time to the applied electric signal were investigated, i.e. channel length, transverse position and solution conductivity. The experimental results show that the EOF response time under a pulsed electric field decreases with the reduction of the microchannel length, distance between the detection position to the wall and the conductivity of the solution. This work could provide a new powerful tool to measure AC electrokinetics and enhance our understanding of AC electrokinetic flows.

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