**Abstract**

Velocity measurement is needed to understand micro flow behaviors. Micro particle image velocimetry (μPIV) is a flow-diagnostic technique that provides velocity fields both qualitatively and quantitatively. Although convention for two-dimensional PIV in macro scale is to illuminate a single plane of the flow with a light sheet whose thickness is less than the depth of field of the image recording system, volume illumination is an alternative approach, whereby the test section is illuminated by a volume of light. In mPIV, seeding particles must be small to exactly follow the flow without clogging the device. At the same time, particles must be large enough to be adequately imaged and dampen the effects of Brownian motion. We have developed mPIV to acquire velocity profile inside the microchannel. Syringe pump is utilized to validate our experimental data. Both pressure driven flow and electroosmotic flow are observed quantitatively and qualitatively. Mixed electroosmotic and pressure driven flows are tested and verified with numerical solutions.

**Preparation of Microchannel**

Channel Material : Poly-di-methyl-siloxane (PDMS)

Fabrication Technique : Standard Soft lithography and Supattering

**Results and Discussions**

![Image](image_url)

**Electrophoretic and Electroosmotic Mean Velocities**

\[ u_{EOP} = \frac{2 e E}{3 \pi d_f \mu} \quad (1) \]

\[ u_{EOF} = \frac{e E \zeta}{\mu} \quad (2) \]

**Conclusions**

- Velocity profile of pressure driven flow in non-rectangular channel is numerically predicted and matched with experimental data very well.
- Both electrophoretic and electroosmotic mean velocities are linearly proportional to applied electric field. This agrees with existing analytical solutions.
- Velocity profile of the pure electroosmotic flow is almost uniform, which is known as "plug-like" flow profile. This also agrees with existing theory.
- Velocity of the mixed flows are superposition of pure electroosmotic flow and pressure driven flow for both favorable and adverse pressure gradient.

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