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Flow Velocity Profile in a Nanocapillary GUIREN WANG, CUIFANG KUANG, WEI ZHAO, University of South Carolina — Although there has been considerable research performed in the area of nanofluidics that is focused on the study of the velocity, only theoretical or simulation results exist. The reason for the lack of experimental evidence could be because that it is very difficulty to measure the flow velocity in nanochannel, where the transverse dimension is between 1–500 nm. We have developed a far field nanoscopic optical velocimetry that can potentially measure the velocity in nanofluidics with nanoscale spatial resolution. It is based on laser induced fluorescence photobleaching and stimulated emission depletion. In this presentation, we report our initial experimental data using water solution in a quartz nanocapillary with an inner diameter of 360 nm. The spatial resolution is better than 70 nm. First, no clear slip-flow is observed. This could probably be due to that our measurement is not accurate enough within 35 nm from the wall. Second, compared with the conventional Hagen-Poiseuille equation, the velocity profile is not purely parabolic. Instead, there seems to be a region, where the velocity profile is not smooth along radial direction and the corresponding velocity gradient is very small. Near the axial region, the velocity gradient is increased again.

Guiren Wang

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