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Nano-Velocimetry for Nanofluidics[1] CUIFANG KUANG, GUIREN WANG, NANOFLUIDICS AND MICROFLUIDICS LAB TEAM — In order to understand physical and biological phenomena in nanoscale and build functional and practical nanofluidic devices, it is important to know the flow velocity profile. Due to the Abbe's diffraction limit barrier, traditional optical methods have so far failed in measuring the velocity profile in a nanochannel. Atomic force microscopy cannot be used for nanochannels without an opened sidewall. We have, for the first time, been able to measure the flow velocity profile for nanofluidics with a spatial resolution better than 70 nm. A novel optical point measurement method is presented, which applies Stimulated Emission Depletion (STED) to Laser Induced Fluorescence Photobleaching Anemometer (LIFPA) techniques to measure flow velocity. Herein we demonstrate this far-field nanoscopic velocimetry by measuring the velocity profile in a nanocapillary with an inner diameter of 360 nm. The closest measuring point from the wall is about 35 nm. The velocity can clearly be differentiated within just a 20 nm step, even near the axial region of the nanocapillary. This method opens up a new class of functional measuring techniques for nanofluidics and for near wall flows.

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