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Measurement of the near-wall velocity profile for a nanofluid flow inside a microchannel[1] ANOOP KANJIRAKAT, REZA SADR, Texas A&M University at Qatar — Hydrodynamics and anomalous heat transfer enhancements have been reported in the past for colloidal suspensions of nano-sized particles dispersed in a fluid (nanofluids). However, such augmentations may manifest itself by study of fluid flow characteristics near in the wall region. Present experimental study reports near-wall velocity profile for nanofluids (silicon dioxide nanoparticles in water) measured inside a microchannel. An objective-based nano-Particle Image Velocimetry (nPIV) technique is used to measure fluid velocity within three visible depths, O(100nm), from the wall. The near-wall fluid velocity profile is estimated after implementing the required corrections for optical properties and effects caused by hindered Brownian motion, wall-particle interactions, and non-uniform exponential illumination on the measurement technique. The fluid velocities of nanofluids at each of the three visible depths are observed to be higher than that of the base fluid resulting in a higher shear rate in this region. The relative increase in shear rates for nanofluids is believed to be the result of the near-wall shear-induced particle migration along with the Brownian motion of the nanoparticles.

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