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Direct Measurement of Liquid Slip Velocities Using Total Internal Reflection Velocimetry PETER HUANG, JEFF GUASTO, KENNETH BREUER, Brown University — The possible existence of slip at a liquid/solid interface is experimentally investigated by measuring velocities of suspended tracer particles in a shear flow. Sub-micron fluorescent particles are imaged within 200 nm of a smooth glass surface using Total Internal Reflection Velocimetry. To accurately infer the slip velocity, imaged particles are sorted into different shear layers according to their intensities and a distance-to-surface calibration. Motions of particles in same shear plane are statistically analyzed to determine slip velocities and slip lengths. For an aqueous suspension flowing over a hydrophilic surface, minimal slip is observed with a slight dependence on shear rate ($l^* = 16$ nm at 2000 s^{-1}). A larger shear-rate dependent boundary slip is observed over a hydrophobic surface ($l^* = 72$ nm at 2000 s^{-1}). This result, in agreement with many recent experiments, rejects some published reports that shear-induced liquid slip length can be as high as one micrometer. Details of the experimental technique, analysis and sources of error, as well as results for non-aqueous liquid slip measurement, are also reported.

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