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Quantification of slip at a liquid-solid interface – a novel approach¹ ALEKS PONJAVIC, MOURAD CHENNAOUI, JANET WONG, Imperial College — Much effort has been spent recently on experimentally proving the existence of interfacial slip of a Newtonian fluid. A constant limitation is the proximity to the surface at which the velocity of a fluid can be measured. A new technique is developed to maximise this proximity. The objective is to acquire velocity measurements of a fluid as close as possible to the liquid-solid interface while still using a direct method of observation. To ensure proximity to the surface the technique of photobleaching is adopted. Dye-doped water is pumped through a microfluidic channel. A short, intense pulse from a laser causes dye within the focal volume to bleach, creating a spot. The geometry of this spot evolves depending on the velocity profile of the fluid. By fitting the evolution of the spot with a Poiseuille velocity profile with slip the slip length is extracted. The hydrophobicity of the channel is varied by flowing silane through the channel prior to measurement, forming a self-assembled monolayer. Effects of shear rate and wettability on interfacial slip length are investigated.

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