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Flow rate and slip length measurements of water in single nanopipes DAVID MALLIN, PETER TABOREK, ANGEL VELASCO, University of California Irvine — Measurements of pressure driven water flows in hydrophobic and hydrophilic fused quartz capillaries of 200 nm diameter are compared. Typical flow rates on the order of 100 femtoliters and pressure drops up to 50 Atm were used. Water exited the capillaries into an oil reservoir where the volume of the pendant drop was monitored using time lapse photography. The typical growth rate for the drop diameter was ˜50 um per day. Flow through a single nanotube can be continued for several weeks. For the untreated quartz capillary, the results are consistent with a no-slip boundary condition. The hydrophilic capillaries are chemically treated with polydimethylsiloxane (PDMS) to form hydrophobic surfaces. Successful surface preparation is confirmed with pressure threshold behavior of the water flow. Our technique can detect slip lengths above 3 nm.

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