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Experimental investigation of flow and slip transition in nanochannels[1] ZHIGANG LI, LONG LI, JINGWEN MO, Hong Kong Univ of Sci & Tech — Flow slip in nanochannels is sought in many applications, such as sea water desalination and molecular separation, because it can enhance fluid transport, which is essential in nanofluidic systems. Previous findings about the slip length for simple fluids at the nanoscale appear to be controversial. Some experiments and simulations showed that the slip length is independent of shear rate, which agrees with the prediction of classic slip theories. However, there is increasing work showing that slip length is shear rate dependent. In this work, we experimentally investigate the Poiseuille flows in nanochannels. It is found that the flow rate undergoes a transition between two linear regimes as the shear rate is varied. The transition indicates that the non-slip boundary condition is valid at low shear rate. When the shear rate is larger than a critical value, slip takes place and the slip length increases linearly with increasing shear rate before approaching a constant value. The results reported in this work can help advance the understanding of flow slip in nanochannels.

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