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Flow enhancement of water flow through silica slit pores with graphene-coated walls[1] HARVEY ZAMBRANO, ENRIQUE WAGEMANN, ELTON OYARZUA, University of Concepcion, J. H. WALTHER, Technical University of Denmark — Nanofluidic devices such as Lab-On-a-Chip often are designed to transport water solutions through hydrophilic nano-conduits. In these systems with narrow confinement, the viscous forces dominate the flow and as a result, the hydrodynamic friction drag is very high. Moreover, the drag and the amount of energy required for pumping a fluid are directly related. Therefore, it is desirable to explore drag reduction strategies in nanoconfined flows. Liquids are known to slip past non-wetting surfaces. Graphene is a single-atom-thick sheet of carbon atoms arranged in a hexagonal honeycomb lattice, which features a unparalleled combination of high specific surface area, chemical stability, mechanical strength and flexibility. Recently, the wettability of water droplets on multilayer graphene sheets deposited on a silica substrate has been investigated. In this study, we investigate the role of graphene coatings to induce flow enhancement in silica channels. We conduct molecular dynamics simulations of pressurized water flow inside silica channels with and without graphene layers covering the walls. In particular, we compute density and velocity profiles, flow enhancement and slip lengths to understand the drag reduction capabilities of multilayer graphene coatings.

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