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Molecular dynamics simulation study of slip flows over surfaces with periodic and random anisotropic textures NIKOLAI PRIEZJEV, Michigan State University — The influence of surface patterns on slip flow of a Lennard-Jones fluid is investigated using molecular dynamics simulations. We consider a situation when the typical pattern size is smaller than the channel width. First, anisotropic slip lengths are reported at low shear rates for flows over periodic stripes of different wettability when the shear flow direction is misaligned with respect to the stripe orientation. The results of MD simulations are compared with continuum predictions. Second, in case of random chemical patterning, the slip length depends sensitively on the total area of wetting texture. Finally, we found that at sufficiently high shear rates the slip length is anisotropic even for atomically flat crystalline surfaces; and, in particular, the slip length is enhanced when the shear flow is oriented along the crystallographic axis of the wall lattice. The simulation results indicate that the onset of the nonlinear regime between the slip length and shear rate is determined by the diffusion of fluid monomers within the first layer.

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