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Modeling the combined effect of surface roughness and shear rate on slip flow of simple fluids ANOOSHEH NIAVARANI, NIKOLAI PRIEZJEV, Michigan State Univesity — Molecular dynamics (MD) and continuum simulations are carried out to investigate the combined effect of shear rate and surface roughness on interfacial slip in simple fluids. For weak wall-fluid interaction energy, the nonlinear shear rate dependence of the slip length in a flow past atomically flat surfaces is obtained from MD simulations. Both the magnitude of the slip length and the slope of its rate-dependence are significantly reduced in the presence of periodic surface roughness. Continuum simulations are used to reproduce the behavior of the effective slip length in a flow over periodically corrugated surface at low shear rates. The continuum analysis includes the functional form of the slip length vs. local shear rate computed from MD simulations. The discrepancy between MD and continuum results at higher shear rates is explained by examination of the local velocity profiles and pressure distribution along the wavy surface.

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