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Toward Generating Low-Friction Nanoengineered Surfaces with Liquid-Vapor Interfaces CHU WANG, XIN YONG, LUCY ZHANG, Rensselaer Polytechnic Institute — Using molecular dynamics (MD), we investigate the importance of liquid-vapor interface topography in designing low friction nanoengineered superhydrophobic surfaces. Shear flow is simulated on patterned surfaces with cylindrical nanoholes and nanopillars. We devise an approach to generate entrapped bubbles with large protrusion angles in MD simulations, where the relationship between the effective slip length and bubble meniscus curvature is attained. We show that protruded bubbles can induce significant friction which hinders the slip characteristics produced on liquid-vapor interfaces. We also demonstrate that the continuity of the liquid-vapor interface greatly influence slip. Good quantitative agreements with previous simulations and analytical models on the asymptotic behavior of slip length with varying gas fraction are obtained. Our results show that we can adopt ideas from continuum scale analysis to design nanoengineered surfaces with large slip, with the caution of detailed interface dynamics at nanoscale.

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