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Enhanced slip on micro-patterned substrates due to contact line depinning JAMES FENG, PENG GAO, Department of Chemical and Biological Engineering, University of British Columbia — We present numerical simulations of a shear flow over a periodically patterned substrate with entrapped gas bubbles. A diffuse-interface model is employed to handle the liquid–gas interface deformation and the three-phase contact line. Depending on the shear rate and the pattern geometry, four flow regimes are observed. The contact lines can be pinned, depinned or eliminated depending on the competition between the shear force and the surface tension. The effective slip length is found to be dependent on the morphology of the menisci and hence on the shear rate. In particular, the bubbles are transformed into a continuous gas film when the shear rate is larger than a critical value, resulting in a significantly enhanced slip length proportional to the liquid–gas viscosity ratio. The present results have interesting implications for effective slip on superhydrophobic surfaces.

Peng Gao
Department of Chemical and Biological Engineering,
University of British Columbia

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