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Inertial and channel confinement effects on laminar flow in microchannels with superhydrophobic surfaces YONGPAN CHENG, CHIANGJUAY TEO, BOOCHEONG KHOO, National University of Singapore, LAB OF FLUID MECHANICS, DEPARTMENT OF MECHANICAL ENGINEERING, NATIONAL UNIVERSITY OF SINGAPORE TEAM — In order to reduce the pressure drop for flow through microchannels, the superhydrophobic surfaces which consist of micro-grooves, posts or holes are widely adopted. In this paper, the effective slip performances of transverse grooves, longitudinal grooves, posts and holes are investigated numerically. The numerical results show that the effective slip lengths of square posts, square holes and transverse grooves decrease with increasing Reynolds number, except those corresponding to longitudinal grooves. For small pattern width to channel height ratios, at low shear-free fractions, the effective slip length corresponding to square posts is equivalent of that of transverse grooves, and their slip lengths are lower than those of square holes and longitudinal grooves. With increasing shear-free fractions, the effective slip length of square posts surpasses those of square holes and longitudinal grooves. Square posts exhibit the highest effective slip length at extremely high shear-free fractions. This study may be useful for applications pertaining to the reduction of flow resistance in microchannels employing superhydrophobic surfaces.

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