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Instantaneous Slip Length in Superhydrophobic Microchannels

AHMED HEMEDA, HOOMAN TAFRESHI, Virginia Commonwealth University, VCU TEAM — Superhydrophobic (SHP) surfaces can be used to reduce the skin-friction drag in a microchannel. This favorable effect, however, can deteriorate over time if the surface geometry is not designed properly. This study presents a mathematical means for studying the time-dependent drag-reduction in a microchannel enhanced with SHP grooves of varying geometries. The performance of an SHP groove is found to be dependent on the interplay between the effects of the apparent contact angle of the air-water interface and the initial volume of the groove. The instantaneous slip length is calculated by solving the Navier-Stokes equations for flow in a microchannel with such SHP grooves, and the results are compared with the studies in the literature.

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