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Does slippage within a superhydrophobic channel always reduce drag? ANNA LEE, Seoul National University, MYOUNG-WOON MOON, Korea Institute of Science and Technology, HO-YOUNG KIM, Seoul National University — It is commonly perceived that super-hydrophobizing channel walls can reduce drag on liquid flowing inside the channel. Here we point out that rough, hydrophobic channels which induce slippage of liquid flows can exert greater drag than hydrophilic channels exhibiting no slippage of liquid. While air pockets formed between liquid and hydrophobic solid structures allow the liquid to slip over themselves, they also reduce the cross-section of the liquid stream. We theoretically set up a criterion for surface structure that determines whether hydrophobizing or hydrophilicizing textured channel walls would be advantageous in reducing drag on liquid flows. On the basis of our theory, we evaluate the efficiency of previously reported superhydrophobic channels in reducing drag as compared to hydrophilic channels. We also experimentally corroborate our theory by measuring the flow rate of water within microchannels of different surface topography and wettability.

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