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Friction Reduction and Robustness for Laminar Fluid Flow on Spray-Coated Superhydrophobic Mesh Surfaces SIDDARTH SRINIVASAN, Massachusetts Institute of Technology, WONJAE CHOI, The University of Texas at Dallas, KYOO-CHUL PARK, SHREERANG CHHATRE, ROBERT COHEN, GARETH MCKINLEY, Massachusetts Institute of Technology — We measure the effective Navier slip length for flow over a liquid-repellent non-wetting surface (fabricated using a spray-deposition technique) which supports a composite solid-liquid-air interface. The morphology of the hydrophobic textured substrate consists of randomly distributed corpuscular microstructures that stabilize a layer of trapped air upon immersion in liquid. The reduction in viscous skin-friction due to this "plastron layer" is evaluated using torque measurements in a parallel plate rheometer, and results in measured slip lengths of $b_{slip} \approx 40\ \mu$m, that are comparable to the mean periodicity of the microstructure. The use of dual-textured spray-coated woven meshes increases the magnitude of the effective slip length to between $b_{slip} \approx 90\ \mu$m to 200 μm depending on the mesh dimensions. We compute the wetted-solid fraction φ_s from surface evolver simulations, and we demonstrate that the experimentally obtained slip-lengths are consistent with the logarithmic prediction of Davis & Lauga. Finally we define a robustness parameter (A^*) to quantify the stability of the plastron. And illustrate the inverse correlation between A^* and b_{slip} by means of a design chart.

Siddarth Srinivasan
Massachusetts Institute of Technology

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