Abstract Submitted
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Longevity and drag reduction of omniphobic surfaces[1] BRIAN ROSENBERG, MOHAMED A. SAMAHA, IAN JACOBI, JESSICA SHANG, MARCUS HULTMARK, Princeton University, ALEXANDER SMITS, Princeton University, Monash University — Omniphobic surfaces, which consist of an omniphobic lubricant impregnated into a micro/nanoscale textured substrate, have been shown to repel a wide range of liquids [Wong et. al (Nature 2011)]. Here, experiments are performed on these surfaces to investigate the drag reduction as well as the time-dependent omniphobicity in the presence of flow. Drag measurements are performed in number of different flows including parallel plate and Taylor-Couette rheometers, pipe flow, and bluff body flows. The longevity of the surfaces are measured using three techniques: (i) an in situ noninvasive optical method to characterize the the loss of lubricant with time; (ii) thin-film interferometry measurements of the lubricant thickness versus time; and (iii) goniometer measurements of the time-dependent threshold sliding angle as well as contact-angle hysteresis. The impact of the substrate morphology on the drag reduction and longevity is observed both with and without flow in the surrounding water environment. This work could help to investigate ways of enhancing the drag-reducing properties of omniphobic surfaces by controlling their morphologies.

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