Abstract Submitted
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Drag reduction using slippery liquid infused surfaces[1] MARCUS HULTMARK, HOWARD STONE, ALEXANDER SMITS, IAN JACOBI, MOHAMED SAMAHA, JASON WEXLER, JESSICA SHANG, BRIAN ROSENBERG, LEO HELLSTRÖM, YUYANG FAN, Princeton University — A new method for passive drag reduction is introduced. A surface treatment inspired by the Nepenthes pitcher plant, previously developed by Wong et al. (2011), is utilized and its design parameters are studied for increased drag reduction and durability. Nano- and micro-structured surfaces infused with a lubricant allow for mobility within the lubricant itself when the surface is exposed to flow. The mobility causes slip at the fluid-fluid interface, which drastically reduces the viscous friction. These new surfaces are fundamentally different from the more conventional superhydrophobic surfaces previously used in drag reduction studies, which rely on a gas-liquid interface. The main advantage of the liquid infused surfaces over the conventional surfaces is that the lubricant adheres more strongly to the surface, decreasing the risk of failure when exposed to turbulence and other high-shear flows. We have shown that these surfaces can reduce viscous drag up to 20% in both Taylor-Couette flow and in a parallel plate rheometer.

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