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Friction Reduction Effects of Wetted Microtexturing in Microchannel Flow[1] NASTARAN RABIEI, CARLOS H. HIDROVO, Department of Mechanical and Industrial engineering, Northeastern University — Microchannel flows are widely used in applications where small diffusion length scales are important, such as in microscale heat exchangers for electronics cooling. However, these small length scales also translate into high pumping power requirements. One possible way to alleviate the large viscous pressure losses associated with this inherent dimensional constrain is to introduce side trenches in a micro-channel to help lower the skin drag. The flow over these transverse trenches may experience two wetting states: Cassie-Baxter and Wenzel. In both states the trapped air or water can act like a cushion resulting in less shear stress. However, it has been shown that sometimes the air-water interface in the Cassie-Baxter state might act like a solid boundary due to contamination. Concurrently, penetration of the flow inside the trenches in the Wenzel state can induce the pressure drag alongside the skin drag. Therefore, the Wenzel state in the trenches can lead to a trade-off between skin and pressure drag. The aim of this work is to understand the geometrical effect that different micro-textures have on the total drag reduction by testing trenches with different aspect ratios and measuring the pressure drop through the micro-channel.

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Nastaran Rabiei
Department of Mechanical and Industrial engineering, Northeastern University

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