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**Investigations of Air Perfusion through Porous Media and Super-Hydrophobic Surface Active Gas Replenishment**[1] MARC PERLIN, JAMES W. GOSE, KEVIN GOLOVIN, STEVEN L. CECCIO, ANISH TUTEJA, Univ of Michigan - Ann Arbor — Super-hydrophobic (SH) materials have been used successfully to generate reduced skin-friction in laminar flows. Success in the laminar regime has led researchers to try SH materials in turbulent flows. More often than not, this has been unsuccessful at providing meaningful skin-friction drag reduction, and has even generated increased drag. This failure is frequently attributed to the wetting of an SH surface or equivalently the transition from the Cassie-Baxter to the Wenzel state. The result is fluid flow over an essentially roughened surface. In this investigation the researchers aim to perfuse small amounts of gas through porous media, including sintered and foam metals, to attain skin-friction drag reduction in a fully-developed turbulent channel flow. As air is perfused through porous media, the solid - liquid interaction at the interface transitions to a solid - liquid - gas interaction. This can result in an interface that functions similarly to SH materials. Controlled air perfusion that provides the necessary replenishment of lost gas at the interface might prevent wetting, and thus eliminate or reduce the effect of the roughness on the flow. This latter possibility is investigated by perfusing small amounts of gas through porous media with and without SH coatings. To quantify the effectiveness of this method, pressure drop is used to infer friction drag along the surface in a fully-developed turbulent channel flow.

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