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Engineered bio-inspired coating for reduction of flow separation HUMBERTO BOCANEGRA EVANS, Texas Tech University, ALI M. HAMED, University of Illinois at Urbana-Champaign, SERDAR GORUMLU, ALI DOOSTTALAB, BURAK AKSAK, Texas Tech University, LEONARDO P. CHAMORRO, University of Illinois at Urbana-Champaign, LUCIANO CASTILLO, Purdue University — Flow control using passive strategies has received notable attention in the last decades as a way to increase mixing and reduce skin drag, among others. Here, we present a bio-inspired coating, composed by uniformly distributed pillars with diverging tips, that is able to reduce the recirculation region in highly separated flows. This is demonstrated with laboratory experiments in a refractive index-matching flume at Reynolds number $\mathrm{Re}_\theta \approx 1200$. The flow over an expanding channel following a S835 wing section was characterized with the coating and with smooth walls. High-resolution, wall-normal particle image velocimetry show a significant reduction of the reversed flow with the coating, where the region with reverse flow was reduced by $\approx 60\%$. The performance of the micro-scale coating is surprising since the size of the fibers are nearly coincident with the viscous length scale ($k^+ \approx 1$). Additionally, the flow control properties of the surface do not depend on hydrophobicity, giving the coating the capability to work in both air and water media.

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