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Electroosmotic flow over superhydrophobic surfaces BARUCH ROFMAN, Technion - Israel Institute of Technology, SEBASTIAN DEHE, Technische Universitt Darmstadt, MORAN BERCOVICI, Technion - Israel Institute of Technology, STEFFEN HARDT, Technische Universitt Darmstadt, MICROFLUIDICS TECHNOLOGY LAB TEAM, INSTITUTE FOR NANO- AND MICROFLUIDICS TEAM — We present the first experimental demonstration of electroosmotic flow enhancement over superhydrophobic surfaces using gate electrodes. Utilizing a hierarchical surface composed of micropillars coated by nanoparticles, we maintain the liquid in a Cassie-Baxter state, thus entrapping air in between the microstructures. We use a gate electrode embedded in the surface to induce charge at the gas-liquid interface, and drive the flow inside a microfluidic chamber. By modifying the pitch of the pillars, we explore the dependence of the velocity on the slip length of the surfaces, confirming the theoretical predictions. For surfaces with large slip we obtain a velocity enhancement of more than an order of magnitude relative to non-slipping surfaces. Furthermore, in contrast to standard solid surfaces, over which EOF is highly sensitive to pH, we show that superhydrophobic surfaces render it essentially independent of pH, enabling a wider utility of electro-osmotic flow in microfluidic devices.

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