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Energy Conversion over Super-hydrophobic Surfaces[1] HUI ZHAO, SHENGJIE ZHAI, University of Nevada Las Vegas — The streaming potential generated by a pressure-driven flow over a charged slip-stick surface with an arbitrary double layer thickness is both theoretically and experimentally studied. To understand the impact of the slip, the streaming potential is compared against that over a homogenously charged smooth surface. Our results indicate that the streaming potential over a super-hydrophobic surface only can be enhanced under certain conditions. In addition, the Onsager relation which directly relates the magnitude of electro-osmotic effect to that of the streaming current effect has been explicitly proved to be valid for thin and thick double layers and homogeneously charged super-hydrophobic surfaces. Comparisons between the streaming current and electro-osmotic mobility for an arbitrary electric double layer thickness under various conditions indicate that the Onsager relation seems applicable for arbitrary weakly charged super-hydrophobic surfaces though there is no general proof. Knowledge of the streaming potential over a slip-stick surface can provide guidance for designing novel and efficient microfluidic energy-conversion devices using super-hydrophobic surfaces.

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Hui Zhao
University of Nevada Las Vegas

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