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Streaming potential generated by a pressure-driven flow over a super-hydrophobic surface HUI ZHAO, University of Nevada Las Vegas — The streaming potential generated by a pressured-driven flow over a weakly charged striped slip-stick surface (the zeta potential of the surface is smaller than the thermal potential (25 mV) with an arbitrary double layer thickness is theoretically studied by solving the Poisson-Boltzmann equation and Stokes equation. A series solution of the streaming potential is derived. Approximate expressions for the streaming potential in the limits of thin double layers and thick double layers are also presented, in excellent agreement with the full solution. 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 when the liquid-gas interface is charged. In addition, as the double layer thickness increases, the advantage of the super-hydrophobic surface diminishes. The impact of a slip-stick surface on the streaming potential might provide guidance for designing novel and efficient microfludic energy conversion devices using a super-hydrophobic surface.

Hui Zhao
University of Nevada Las Vegas

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