

Streaming potential for microchannels of arbitrary cross-sectional shapes for thin electric double layers

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The streaming potential of electrokinetic flows in microchannels reacts low rate and is usually exploited to determine the zeta potential of microchannels. In the present investigation, we derive a semi-analytic formula for the streaming potential of microchannels with arbitrary cross-sectional shapes valid for high zeta potentials as well as reasonably low zeta potentials. This formula satisfies the Onsager reciprocity principle at the limit of low zeta potential where the Debye-Hückel approximation is valid. The simple semi-analytic formula for the streaming potential derived in the present work can be employed to investigate electrokinetic flows and determine the zeta potentials of microchannels with arbitrary cross-sectional shapes.