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Streaming Potential of an Electrolyte in a Microchannel with an Axial Temperature Gradient MATHIAS DIETZEL, STEFFEN HARDT, Institute for Nano- & Microfluidics, Center of Smart Interfaces, TU Darmstadt — The effect of a temperature gradient parallel or antiparallel to the main flow direction of a pressure-driven symmetric electrolyte in a slit-microchannel is investigated. Based on the non-isothermal Nernst-Planck equations as well as on the Poisson equation, and under the assumption that the intrinsic Soret coefficient S^* is the same for each ion species, an analytical expression of the electric double layer (EDL) potential is derived. Since the local EDL thickness is found to increase exponentially with temperature, a temperature difference δT applied along a channel exhibiting a constant surface zeta potential leads to a corresponding gradient in the EDL thickness. For large pressure differences δp_0, the non-isothermal streaming potential can be adequately described by the well known isothermal expression if the local modification of the Debye length due to the thermal effect is taken into account. For small channel heights at small driving pressure differences, the streaming potential is seen to be over-predicted (under-predicted) by the (Debye-length corrected) isothermal expression for positive (negative) values of $S^*\delta T/\delta p_0$. With vanishing pressure difference, the steady-state thermoelectric potential of confined electrolytes is derived.

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