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A perturbative thermal analysis for an electro-osmotic flow in a slit microchannel based on a Lubrication theory ALI RAMOS, FEDERICO MENDEZ, Univ Nacl Autonoma de Mexico, OSCAR BAUTISTA, Instituto Politcnico Nacional, JOS LIZARDI, Universidad Autonma de la Ciudad de Mexico — In this work, we develop a new thermal analysis for an electro-osmotic flow in a rectangular microchannel. The central idea is very simple: the Debye length that defines the length of the electrical double-layer depends on temperature T. Therefore, if exists any reason to include variable temperature effects, the above length should be utilized with caution because it appears in any electro-osmotic mathematical model. For instance, the presence of the Joule effect is a source that can generate important longitudinal temperature gradients along the microchannel and the isothermal hypothesis is no longer valid. In this manner, the Debye length is altered and as a consequence, new longitudinal temperature gradient terms appear into the resulting governing equations. These terms are enough to change the electric potential and the flow field. Taking into account the above comments, in the present study the momentum equations together with the energy, Poisson and Ohmic current conservation equations are solved by using a regular perturbation technique. For this purpose, we introduce a dimensionless parameter α that measures the temperature deviations of a reference temperature.

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