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Theoretical analysis of non-linear Joule heating effects over an electro-thermal patterned flow[1] SALVADOR SANCHEZ, GABRIEL ASCANIO, CCADET, Universidad Nacional Autonoma de Mexico, FEDERICO MENDEZ, Facultad de Ingenieria, Universidad Nacional Autnoma de Mexico, OSCAR BAUTISTA, Instituto Politecnico Nacional — In this work, non-linear Joule heating effects for electro-thermal patterned flows driven inside of a slit microchannel are analyzed. Here, the movement of fluids is controlled by placing electro-thermal forces, which are generated through an imposed longitudinal electric field, E_0, and the wall electric potential produced by electrodes inserted along the surface of the microchannel wall, ζ. For this analysis, viscosity and electrical conductivity of fluids are included as known functions, which depend on the temperature; therefore, in order to determine the flow, temperature and electric potential fields together with its simultaneous interactions, the equations of continuity, momentum, energy, charges distribution and electrical current have to be solved in a coupled manner. The main results obtained in the study reveal that with the presence of thermal gradients along of the microchannel, local electro-thermal forces, $\bar{F}_\chi$, are affected in a sensible manner, and consequently, the flow field is modified substantially, causing the interruption or intensification of recirculations along of the microchannel.

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