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COMPUTATIONAL STUDY FOR HEAT TRANSFER IN MICROCHANNEL WITH ELECTROKINETIC EFFECTS AND SINUSOIDAL BOUNDARY CONDITIONS ON BOTH SIDE WALLS

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ABSTRACT In this study, we have numerically analysed the interfacial electrokinetic effects on the pressure-driven flow through the microchannel. An additional source term resulting from electrokinetic effects was introduced in conventional momentum equation, thereby modifying the flow and heat transfer attributes. The horizontal walls of the channel are adiabatic while the vertical walls have sinusoidal temperature variation. A numerical procedure based on finite-difference scheme is adapted to solve the governing flow and energy equations with slip effects and sinusoidal boundary temperature respectively. The results are obtained for various combinations of physical parameters appearing in the resulting governing equations. We have also checked the regularity of solutions for pertinent model using energy estimate. It is concluded that heat transfer rate increases with the phase deviation up to $\phi = \pi / 2$ and then it decreases for further increase in the phase deviation. Also it is observed that the flow behaviour and heat transfer rate at the microscale are strongly affected by the presence of the electric double layer (EDL).