Effect of Transverse Steady Magnetic Field on MHD Flow Under Free Convection Conditions in Vertical Microchannels.

Comsol software was used to investigate the effect of temperature jump and velocity slip on the hydrodynamic and thermal behavior of MHD flows under free convection conditions between parallel vertical plates and along a vertical plate. Further, the continuum model of fluid was used with Knudssen (Kn) number regime $0.001 < Kn < 0.1$, with the Maxwell slip velocity being applied along with the Smoluchowski temperature jump boundary on the solid-fluid surface interface. It was found that the applied transverse magnetic produces Lorentz force tends to retard the flow velocity, which was found to be directly proportional with both the magnetic field number (N) and the Knudsen Number (Kn). This decrease in the flow velocity was recorded in the case of two parallel plates, while Lorentz force was found to decreases the thickness of the velocity boundary layer in the case of a single plate. Also, it was found that the increase in the magnetic field applied and the increase of Kn number lead to a decrease of the skin friction factor, Nusselt (Nu) number and the thickness of the velocity boundary layer. Finally, it was fond that the applied magnetic field will cause an increase in the fluid temperature and hence both the friction coefficient factor and Nusselt number will be decreased by the increase of both Kn number and the magnetic influence number N.