Numerical Analysis of the Effects of Transpiration on Transient/Steady Natural Convection Flow of Reactive Viscous Fluid in a Vertical Channel Formed by Two Vertical Porous Plates

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Abstract : This study is devoted to investigate the effect of transpiration on transient as well as steady-state natural convection flow of a reactive viscous fluid in a vertical channel formed by two infinite vertical parallel porous plates. The Boussinesq assumption is applied and the nonlinear governing equations of energy and momentum are developed. The problem is solved numerically using implicit finite difference method and analytically for steady-state case using perturbation method. Solutions are presented in graphical form for fluid temperature, velocity, and skin-friction and wall heat transfer rate for various parametric values. It is found that velocity, temperature, rate of heat transfer as well as skin-friction are strongly affected by mass leakage through the porous plates.

Keywords : transpiration, reactive viscous fluid, porous plates, natural convection, suction/injection
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