Unsteady Natural Convection in a Square Cavity Partially Filled with Porous Media Using a Thermal Non-Equilibrium Model

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Abstract : Unsteady natural convection and heat transfer in a square cavity partially filled with porous media using a thermal non-equilibrium model is studied in this paper. The left vertical wall is maintained at a constant hot temperature and the right vertical wall is maintained at a constant cold temperature, while the horizontal walls are adiabatic. The governing equations are obtained by applying the Darcy model and Boussinesq approximation. COMSOL's finite element method is used to solve the non-dimensional governing equations together with specified boundary conditions. The governing parameters of this study are the Rayleigh number, the modified thermal conductivity ratio, the inter-phase heat transfer coefficien and the time independent. The results presented for values of the governing parameters in terms of streamlines in both fluid/porous layer, isotherms of fluid and solid porous layer, isotherms of fluid layer, and average Nusselt number.