

Abstract

Mohamed Abd El Fatah Mohamed Teamah

Augmentation of natural convective heat transfer in square cavity by utilizing nanofluids in the presence of magnetic field and uniform heat generation/absorption

Natural convection in a square cavity filled with different nanofluids is studied numerically. Both upper and lower surfaces are being insulated, whilst a uniform magnetic field is applied in a horizontal direction. Constant different temperatures are imposed along the vertical walls of the enclosure, steady state laminar regime is considered. The transport equations for continuity, momentum, energy are solved. The numerical results are reported for the effect of Rayleigh number, solid volume fraction, both Hartmann number, heat generation/absorption coefficient on the iso-contours of streamline and temperature. In addition, the predicted results for average Nusselt are presented for various parametric conditions. This study was done for $10^3 \leq Ra \leq 10^7$, $0 \leq Ha \leq 60$, $0 \leq f \leq 0.06$, $10 \leq q \leq 10$ while the Prandtl number represent water is kept constant at 6.2. The results show that for weak magnetic field the addition of nanoparticles is necessary to enhance the heat transfer but for strong magnetic field there is no need for nanoparticles because the heat transfer will decrease. On the other hand to augment the heat transfer nanoparticles volume fraction must be increased but with a small value of heat absorption coefficient ($q < 0$) at constant Hartmann and Rayleigh numbers.