Abstract

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Brownian motion effect on natural convection in square cavity filled with cu-water nanofluid in the presence of magnetic field

Brownian motion effect on natural convection in a two dimensional square cavity filled with cu-water nanofluid in the presence of magnetic field applied in the horizontal direction is investigated numerically. Laminar regime is considered under steady state condition. The transport equations for continuity, momentum, and energy equations are solved using the finite volume technique. The validity of the numerical method used is ascertained and good agreement was found with recently published numerical results. A parametric study illustrating the influence of thermal Rayleigh number, magnetic field (Hartmann number), Prandtl number and solid volume fraction effect on the fluid velocity, temperature, as well as Nusselt number is conducted. This study is done for Rayleigh Number 103 ? Ra ? 106,Hartmann Number 0 ? Ha ? 60, Solid Volume Fraction 1% ? ? ? 4% and Prandtl Number Pr=0.01,6.2 and 100.The upper and lower surfaces are insulated and two isothermal vertical walls at temperatures Th and Tc. The concluding chapter illustrates the effect of magnetic field on the heat transfer in a two dimensional square cavity. The magnetic ?eld reduces the heat transfer and ?uid circulation within the enclosure due the retardation effect of the electromagnetic body force. In addition, the results revealed that the heat transfer mechanisms and the flow characteristics inside the enclosure depend strongly on the Rayleigh number. Moreover, when the Brownian motion effect is considered without adding magnetic field, the solid volume fraction and the Prandtl number will affect the performance of the heat transfer.