Numerical Investigation of Mixed Convection Heat Transfer of Nanofluid in a Lid Driven Square Cavity with Three Triangular Heating Blocks

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Abstract

The present investigation addressed mixed convection heat transfer of nanofluid in a lid driven square cavity with three triangular heating blocks. Finite volume discretization method with SIMPLE algorithm is employed for solving the two-dimensional Navier-Stokes and energy balance equations. The method used is validated against previous works. Two cases were considered depending on the position of three triangular heating blocks. Effects of pertinent parameters such as: position of triangular heating blocks, the Richardson number (0.1 ≤ Ri ≤ 100), the Prandtl number of the pure water (Pr = 6.2) and the volume fraction of nanoparticles (0 ≤ φ ≤ 0.05) on the flow and Nusselt number are investigated. The results of this study illustrate that, by reducing Richardson number and increasing the volume fraction of nanoparticles, the average Nusselt number increases. It is also found that there is an optimal position of triangular heating blocks where the heat transfer rate is maximized.

References


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Index Terms

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Keywords

Mixed convection, Lid driven, Cavity, Triangular block, Nanofluid.