World Academy of Science, Engineering and Technology
International Journal of Physical and Mathematical Sciences
Vol:17, No:03, 2023

Analysis of Natural Convection within a Hexagonal Enclosure Full with Nanofluid (Water-Cu) Under Effect of the Position of the Inner Obstacle

Authors : Lakhdar Rahmani, Benhanifia Kada, Brahim Mebarki

Abstract : The present paper aims to investigate the natural convection of nanofluid (water-cu) inside a hexagonal enclosure shape embedded with a square obstacle in the presence of hot and cold side walls. The governing equations were solved in a non-uniform unstructured grid by employing the Galerkin finite element method using the software COMSOL Multiphysics. The objective of this study is to analyze the influence of Rayleigh number (103 < Ra < 105), the position of the obstacle, which is located in three different positions (center, bottom, and top side), and the effect of Nanoparticles volume concentration (0 < Ø < 0.2) on the thermal behavior inside the enclosure, The results are reported as contours of isotherms, streamlines, and average Nusselt numbers. The obtained results illustrate that the increase in the Rayleigh number (Ra) and the Nanoparticles concentration (Ø) leads to an increase in the Nusselt number (Nu average) that signifies the rate of heat transfer in the studied enclosure, in addition to the best performance observed with the position of obstacle that is located at the middle of the enclosure, where has a high effect in improving the heat transfer along the enclosure comparatively with the rest different positions.

Keywords : natural convection, nanofluid (water-Cu), hexagonal enclosure, Nusselt numbers, Rayleigh number
Conference Title : ICAPN 2023 : International Conference on Applied Physics and Nanomaterials
Conference Location : Istanbul, Türkiye
Conference Dates : March 20-21, 2023