International Journal of Mechanical Engineering (IJME)
ISSN(P): 2319-2240; ISSN(E): 2319-2259
Vol. 3, Issue 1, Jan 2014, 35-46

International Academy of Science, Engineering and Technology
Connecting Researchers; Nurturing Innovations

NATURAL CONVECTION HEAT TRANSFER INSIDE AN INCLINED SQUARE ENCLOSURE FILLED WITH AL_2O_3 NANOFLUID IN PRESENCE OF PAIR OF DISCRETE HEAT FLUX SOURCES IN BOTTOM WALL

HAYDER KRAIDI RASHID NASRAWI

Department of Mechanics, Babylon University, College of Engineering, Babylon, Iraq

ABSTRACT

The significant of suspended nanoparticle in fluid is the enhancement of heat transfer rate and fluid flow. The effect of the nanoparticle Al_2O_3 on the thermal properties and then heat transfer rate of the base fluid (water) that filled square enclosure cavity with presence of pair of discrete heat flux sources in bottom wall was numerically investigated. Also, the inclination angle was varied over the range of (0^o-60^o) in order to predict the sensitive of the enclose cavity in point of view heat transfer rate and nanofluid flow. Moreover, the relations between angles of inclination and Rayleigh number in conventional fluid are presented. However, the Rayleigh number range that was used in current work is (10^3-10^6). The influence of nanoparticle volume fraction on streamline and temperature distribution contour at different inclination angle with Rayleigh number equal to 10^6 is illustrated. The results show that the heat transfer enhancement increase with increase Rayleigh number. Besides, the increases in concentration of volume fraction at certain inclination angle and with Rayleigh number equal to 10^6 will reduce strength of the streamline function. Finally, the obtained results show that the new proposal by presented pair of discrete heat flux sources in bottom wall of cavity that filled with nanofluid is very benefit for improving the heat transfer rate and fluid flow.

KEYWORDS: Square Cavity, Nanofluid, Al_2O_3, Isoflux, Inclination Angle, Natural Convection