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Mixed convection in a nanofluid filled-cavity with partial slip subjected to constant heat flux and inclined magnetic field
(2016) *Journal of Magnetism and Magnetic Materials*, 416, pp. 25-36. Cited 33 times.

Abstract
Mixed convection in a lid-driven square cavity filled with Cu-water nanofluid and subjected to inclined magnetic field is investigated in this paper. Partial slip effect is considered along the lid driven horizontal walls. A constant heat flux source on the left wall is considered, meanwhile the right vertical wall is cooled isothermally. The remainder cavity walls are thermally insulted. A control finite volume method is used as a numerical appliance of the governing equations. Six pertinent parameters were studied these; the orientation of the magnetic field (Φ=0-360°), Richardson number (Ri=0.001-1000), Hartman number (Ha=0-100), the size and position of the heat source (B=0.2-0.8, D=0.3-0.7, respectively), nanoparticles volume fraction (φ=0.0-0.1), and the lid-direction of the horizontal walls (λ=±1) where the positive sign means lid-driven to the right while the negative sign means lid-driven to the left. The results show that the orientation and the strength of the magnetic field can play a significant role in controlling the convection under the effect of partial slip. It is also found that the natural convection decreases with increasing the length of the heat source for all ranges of the studied parameters, while it is do so due to the vertical distance up to Hartman number of 50, beyond this value the natural convection decreases with lifting the heat source narrower to the top wall. © 2016 Elsevier B.V.

2-s2.0-84970983933
Document Type: Article
Publication Stage: Final
Source: Scopus