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MHD mixed convection of localized heat source/sink in a nanofluid-filled lid-driven square cavity with partial slip
(2016) *Journal of the Taiwan Institute of Chemical Engineers*, 68, pp. 173-186. Cited 34 times.

Abstract
Magneto-hydrodynamic mixed convection in a lid-driven square cavity filled with Cu–water nanofluid is investigated in this paper. Partial slip effect is considered along the lid driven horizontal walls. A segment of the left wall is considered as a heat source, meanwhile a heat sink is placed on the right wall of cavity. The remainder cavity walls are thermally insulated. A control finite volume method is adopted as a numerical appliance of the present study. The study is achieved by controlling the effect of a set of pertinent parameters, these are; the size and position of the heat source/sink (B = 0.2–0.8, D = 0.3–0.7, respectively), the Hartman number (Ha = 0–100), Richardson number (Ri = 0.001–10), nanoparticle volume fraction (ϕ=0.0−0.1), partial slip parameter (S=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 shortest length of the heat source/sink localized midway of the vertical walls give the maximum convective heat transfer, and the best direction of the horizontal walls is that when they are both lid-driven to the left. For very strong applied magnetic field, the lid-direction becomes inactive. © 2016 Taiwan Institute of Chemical Engineers

2-s2.0-84994156971
Document Type: Article
Publication Stage: Final
Source: Scopus