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Mohebbi, R., Izadi, M., Chamkha, A.J.

Heat source location and natural convection in a C-shaped enclosure saturated by a nanofluid
(2017) *Physics of Fluids*, 29 (12), art. no. 122009, . Cited 52 times.

Abstract
In this work, the effect of the presence of a heat source and its location on natural convection in a C-shaped enclosure saturated by a nanofluid is investigated numerically using the lattice Boltzmann method. Fifteen cases consisting of different heat source locations attached to an isolated wall of the enclosure have been considered to achieve the best configuration at different Rayleigh numbers (103-106) and various solid volume fractions of the nanofluid (0-0.05). Results are shown in terms of the streamlines, isothermal lines, velocity profiles, and the local and average Nusselt numbers. The numerical solution is benchmarked against published results from previous studies for validation, and a good agreement is demonstrated. According to the results, at Ra = 103, the maximum Nusselt number is achieved when the heat source is located within the upper horizontal cavity. Moreover, at higher Rayleigh numbers (Ra = 106) and locations of the heat source within the vertical cavity yield the best Nusselt numbers. Compared to the base fluid and at low Rayleigh numbers, the increase in the Nusselt number of the nanofluid is not found to be dependent on the location of the heat source. However, for high Rayleigh numbers, the maximum increase is obtained when the heat source is located in the upper part of the vertical. © 2017 Author(s).

2-s2.0-85040123337
Document Type: Article
Publication Stage: Final
Source: Scopus