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Darcian natural convection in an inclined trapezoidal cavity partly filled with a porous layer and partly with a nanofluid layer
(2017) *Sains Malaysiana*, 46 (5), pp. 803-815. Cited 2 times.

Abstract
The problem of Darcian natural convection in a trapezoidal cavity partly filled with porous layer and partly with nanofluid layer is studied numerically using finite difference method. The left slopping wall is maintained at a constant hot temperature and the right slopping wall is maintained at a constant cold temperature, while the horizontal walls are adiabatic. Water-based nanofluids with Ag or Cu or TiO2 nanoparticles are chosen for the investigation. The governing parameters of this study are the Rayleigh number (104 ≤ Ra ≤ 107), Darcy number (10-5 ≤ Da ≤ 10-3), nanoparticle volume fraction (0 ≤ φ ≤ 0.2), porous layer thickness (0.3 ≤ S ≤ 0,7), the side wall inclination angle (0° ≤ φ ≤ 21.8°) and the inclination angle of the cavity (0° ≤ ω ≤ 90°). Explanation for the influence of various above-mentioned parameters on streamlines, isotherms and overall heat transfer is provided on the basis of thermal conductivities of nanoparticles, water and porous medium. It is shown that convection increases remarkably by the addition of silver-water nanofuid and the heat transfer rate is affected by the inclination angle of the cavity variation. The results have possible applications in heat-removal and heat-storage fluid-saturated porous systems.

2-s2.0-85022220314
Document Type: Article
Publication Stage: Final
Source: Scopus
Access Type: Open Access