Thermal performance assessment in a porous media for a vented enclosure with hot obstacle

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Résumé

In the present paper, thermal and dynamic assessment is highlighted in a vented fluid saturated porous media with hot obstacle. A mesoscopic approach based on D2Q9 Thermal Lattice Boltzmann Method (TLBM) by using the Darcy- Forchheiman model is applied. A laminar, two dimensional and incompressible flow is considered. The goal in this paper is to investigate the effect of the presence of the porous medium on the convective heat transfer in a given obstructed vented cavity. The numerical simulations are conducted for various Richardson numbers and porosities. The cold entering fluid temperature is of constant velocity. After having passed over the hot obstcle block, the fluid leaves the cavity with a moderate high temperature. Moreover, the no-slip hydrodynamic is also used at the solid boundaries. Besides, zero gradient is used at the outlet wall. The bottom and the top sides of the porous enclosure are thermally isolated. A partially thermally isolated vertical wall facing the partially opening sidewall is considered. The partial slice of left and the right wall of the cavity are with a fixed length as (H /11), is fixed at a hot and cold temperature, respectively. The partial right side is open to the ambient physical conditions. The influences of Richardson number and porosities on convection characteristics, namely isotherms, streamlines, centerline variations of horizontal and vertical, average and local Nusselt numbers are explored for a fixed Darcy numbery and Prandtl number.

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