# THE EFFECTS OF POROUS LAYER ON HEAT TRANSFER PERFORMANCE INSIDE A CAVITY: LATTICE BOLTZMANN APPROACH

M. Nazari[1*], M.H. Kayhani[1], A.A.H. Bagheri[1]
[1] Department of Mechanical Engineering, Shahrood Univ. of Technology, Shahrood, Iran;
*Correspondence author: Fax: +982733392204 Email: **nazari_me@yahoo.com**

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## ABSTRACT

Fluid flow and natural convection heat transfer in an enclosure partially filled with porous medium is motivated many authors because of its application in many filed of engineering.
In this paper, fluid flow and natural convection heat transfer in a cavity which contains a vertical porous layer is studied.
In this simulation a thermal lattice Boltzmann method base on Brinkmann-Forchheimer extended Darcy model has been employed that overcomes the limitations of Darcy or Brinkmann model for flows in porous media. After validating the obtained results in two limit cases, i.e. natural convection in a porous cavity and natural convection in a cavity in absence of porous media, the effects of dimensionless parameters such as *Rayleigh number*, *Darcy number*, the *porosity* of the porous layer and especially the effects of configurations and the thickness of the porous layer on flow pattern and heat transfer features are studied.
By changing the value of *Darcy-Rayleigh* number, the dominant heat transfer mechanism is changed. As expected, by increasing the value of the porosity (of internal porous layer) the averaged Nusselt number is increased; but this trend sometimes is reversed when the dominant mechanism of heat transfer is similar to conduction. We will discuss this matter completely.
By analysis of the configuration and thickness of internal porous layer, the optimal heat transfer rate can be obtained.