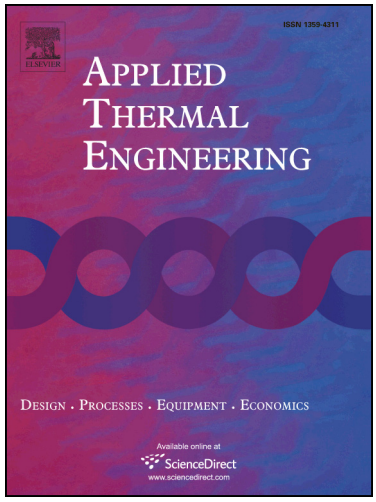

Research Paper

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Free convection in a partially heated wavy porous cavity filled with a nanofluid under the effects of Brownian diffusion and thermophoresis

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ABSTRACT

Numerical analysis of natural convective heat transfer and fluid flow inside a porous wavy cavity filled with a nanofluid has been carried out. The domain of interest is a square cavity with a left isothermal wavy wall, while other walls are flat. A heat source of constant temperature is located on the right vertical wall. Governing equations formulated in terms of the dimensionless variables using the Darcy–Boussinesq approximation have been solved on the basis of finite difference method of the second order accuracy. The two-phase nanofluid model including the Brownian diffusion and thermophoresis effects has been used for simulation of nanofluid transport inside the cavity. Analysis has been conducted in a wide range of the Rayleigh number, undulation number and heat source size. It has been found that the local heat source has an efficient influence of the nanofluid flow and heat transfer rate.

Keywords: Nanofluid; free convection; wavy cavity; porous medium; partial heating effect; numerical results

1. Introduction

Free convection flow and heat transfer in porous medium has attracted the interest of many researchers in recent years because it is encountered in many industrial applications such as geothermal reservoirs, float glass production, flow and heat transfer in solar ponds, air conditioning in rooms, optimization of solidification processes of metals and alloys, waste nuclear processing, dissemination control of chemical waste and pollutants, electronic packages and microelectronic devices during their

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