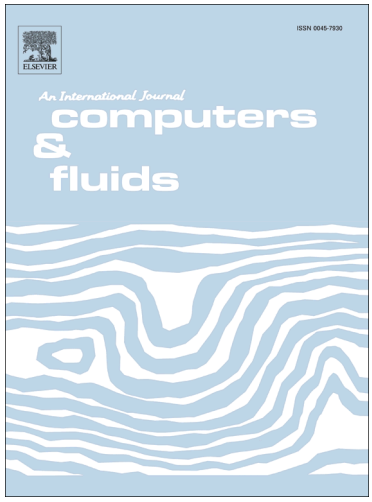

Simulation of vertical and horizontal magnetic fields effects on non-Newtonian power-law fluids in an internal flow using FDLBM

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Simulation of vertical and horizontal magnetic fields effects on non-Newtonian power-law fluids in an internal flow using FDLBM

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Abstract

In this paper, the effect of a magnetic field on non-Newtonian fluid flow in a lid-driven cavity has been analyzed by Finite Difference Lattice Boltzmann Method (FDLBM). It was assumed that the viscosity of the fluid flow is shear-dependent as the power-law model has been selected for the viscosity of the flow. This study has been performed for the certain pertinent parameters of Reynolds number (Re=100 - 1000), Stuart number (N=0-50) and power-law index (n=0.6-1.4) as the magnetic field is applied at different inclinations of $\gamma=0^{\circ}$ and 90°. Results show that the increment of Reynolds number augments the effect of magnetic field on the fluid flow. Furthermore, the drop in the power-law indexes increases the influence of the magnetic field at the inclined angle of $\gamma=90^{\circ}$. The greatest effect of the horizontal magnetic field ($\gamma=0^{\circ}$) is observed for the power-law index of n=1.

Keywords: Lid-driven cavity, Non-Newtonian flow, MHD, FDLBM

Introduction

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