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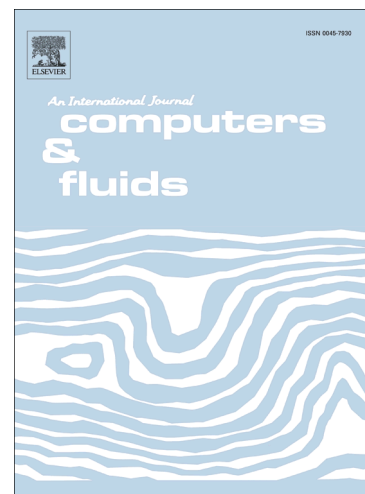
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Simulation of vertical and horizontal magnetic fields effects on non-Newtonian power-law fluids in an internal flow using FDLBM

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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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