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Influence of magnetic field on Al₂O₃-H₂O nanofluid forced convection heat transfer in a porous lid driven cavity with hot sphere obstacle by means of LBM

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Abstract

In this research, nanofluid flow in a three dimensional porous cavity under the impact of magnetic field is simulated by means of Lattice Boltzmann Method. The enclosure is full of Al₂O₃-H₂O nanofluid. Properties of nanofluid are estimated via single phase model considering Brownian motion effect. Mesoscopic simulations are done for various values of Darcy number, Hartmann number and Reynolds number. Results demonstrate that temperature gradient has direct relationship with Darcy number and Reynolds number. Increasing Lorentz forces leads to reduce in Nusselt number.

Keywords: Nanofluid; Lorentz forces; Forced convection; Lattice Boltzmann Method; Sphere obstacle; Porous medium.

Nomenclature

f_k^{eq}	Equilibrium distribution.	τ	Lattice relaxation time
u, v, w	Velocity components	ϕ	Volume fraction
e_α	Discrete lattice velocity in direction	β	Thermal expansion coefficient

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