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Analysis of flow and heat transfer in water based nanofluid due to magnetic field in a porous enclosure with constant heat flux using CVFEM

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Abstract

Impact of Lorentz forces on CuO-water nanofluid flow in a permeable enclosure is presented by means of CVFEM. Darcy law is applied for porous media. In order to predict properties of nanofluid, KKL model has been utilized. Important parameters are inclination angle ($\xi = 0^\circ$ to 90°), CuO-water volume fraction ($\phi = 0$ and 0.04), Hartmann ($Ha = 0$ to 20) and Rayleigh ($Ra = 10^2, 250$ and 10^3) numbers for porous medium. A formula for Nu_{ave} is provided. Results demonstrated that Nusselt number detracts with enhance of ξ, Ha. Heat transfer augmentation detracts with rise of buoyancy forces but it enhances with rise of inclination angle and Hartmann number.

***Keywords*:** Porous media; Nanofluid; Elliptic cylinder; MHD; Natural convection; KKL model.

Nomenclature

B	Magnetic field	ξ	Rotation angle
K	permeability of the porous medium	Θ	dimensionless temperature
E	Heat transfer enhancement	Ω & Ψ	dimensionless vorticity & stream function
$\vec{I}$	electric current	β	Thermal expansion coefficient
T	Fluid temperature	σ	Electrical conductivity
Nu	Nusselt number	μ	Dynamic viscosity

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