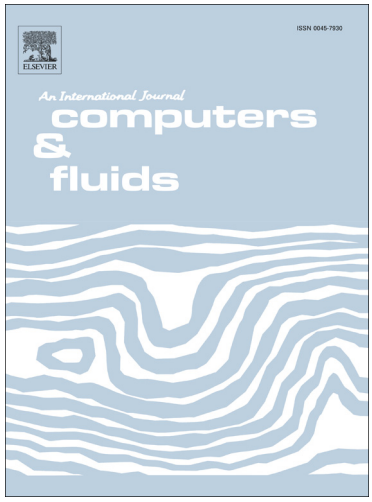

Three dimensional numerical analysis of magnetic field effect on Convective heat transfer during the MHD steady state laminar flow of liquid lithium in a cylindrical pipe

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THREE DIMENSIONAL NUMERICAL ANALYSIS OF MAGNETIC FIELD EFFECT ON CONVECTIVE HEAT TRANSFER DURING THE MHD STEADY STATE LAMINAR FLOW OF LIQUID LITHIUM IN A CYLINDRICAL PIPE

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ABSTRACT

In this study, effect of perpendicularly applied magnetic field on steady state laminar liquid lithium flow in a horizontal circular pipe was theoretically analysed with 3D computer base programme. Convective heat transfer behaviour has been examined. Liquid lithium flow was observed for two different conditions as cooling and heating with constant wall temperature. Analyse was proceeded for thermal fully developed but hydro-dynamically transient region of flow. Calculation was carried out with ANSYS Fluent software. As a result, by the increase of magnetic field induction, the local flow velocity was decreased, but the Nusselt number, skin friction coefficient and pressure was increased for the heating and cooling conditions of liquid lithium through the pipe length. Additionally, while the liquid lithium was heating the fluid temperature was decreased and also while the liquid lithium was cooling the fluid temperature was increased by the increase of magnetic field induction through the pipe length. Increase of magnetic field induction enhanced the convective heat transfer and so, indirectly improved the cooling and heating of liquid lithium.

Key Words: Magneto hydrodynamic flow, convective heat transfer, magnetic field induction, liquid lithium, Nusselt number, skin friction coefficient.