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Electrohydrodynamic free convection heat transfer of a nanofluid in a semi-annulus enclosure with a sinusoidal wall

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Abstract

Natural convection heat transfer of a nanofluid in the presence of an electric field is investigated. The control volume finite element method (CVFEM) is utilized to simulate this problem. A Fe₃O₄-ethylene glycol nanofluid is used as the working fluid. The effect of the electric field on nanofluid viscosity is taken into account. Numerical investigation is conducted for several values of Rayleigh number, nanoparticle volume fraction, and the voltage supplied. The numerical results show that the voltage used can change the flow shape. The Coulomb force causes the isotherms to become denser near the bottom wall. Heat transfer rises with increase in the voltage supplied and Rayleigh number. The effect of electric field on heat transfer is more pronounced at low Rayleigh numbers due to the predomination of the conduction mechanism. © 2016 Taylor & Francis.

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