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Numerical Simulation of Unsteady Natural Convective Nanofluid Flow within a Trapezoidal Enclosure Using Meshfree Method

Authors : S. Nandal, R. Bhargava

Abstract : The paper contains a numerical study of the unsteady magneto-hydrodynamic natural convection flow of nanofluids within a symmetrical wavy walled trapezoidal enclosure. The length and height of enclosure are both considered equal to L. Two-phase nanofluid model is employed. The governing equations of nanofluid flow along with boundary conditions are non-dimensionalized and are solved using one of Meshfree technique (EFGM method). Meshfree numerical technique does not require a predefined mesh for discretization purpose. The bottom wavy wall of the enclosure is defined using a cosine function. Element free Galerkin method (EFGM) does not require the domain. The effects of various parameters namely time t, amplitude of bottom wavy wall a, Brownian motion parameter Nb and thermophoresis parameter Nt is examined on rate of heat and mass transfer to get a visualization of cooling and heating effects. Such problems have important applications in heat exchangers or solar collectors, as wavy walled enclosures enhance heat transfer in comparison to flat walled enclosures.

Keywords : heat transfer, meshfree methods, nanofluid, trapezoidal enclosure
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