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Numerical Simulation of Convective Flow of Nanofluids with an Oriented Magnetic Field in a Half Circular-Annulus

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Abstract : The unsteady convective heat transfer flow of nanofluids in a half circular-annulus shape enclosure using nonhomogeneous dynamic model has been investigated numerically. The round upper wall of the enclosure is maintained at constant low temperature whereas the bottom wall is heated by three different thermal conditions. The enclosure is permeated by a uniform magnetic field having variable orientation. The Brownian motion and thermophoretic phenomena of the nanoparticles are taken into account in model construction. The governing nonlinear momentum, energy, and concentration equations are solved numerically using Galerkin weighted residual finite element method. To discover the best performer, the average Nusselt number is demonstrated for different types of nanofluids. The heat transfer rate for different flow parameters, positions of the annulus, thicknesses of the half circular-annulus and thermal conditions is also exhibited.

Keywords : nanofluid, convection, semicircular-annulus, nonhomogeneous dynamic model, finite element method
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