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Flow Dynamics of Nanofluids in a Horizontal Cylindrical Annulus Using Nonhomogeneous Dynamic Model

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Abstract : Transient natural convective flow dynamics of nanofluids in a horizontal homocentric annulus using nonhomogeneous dynamic model has been experimented numerically. The simulation is carried out for four different shapes of the inner wall, which is either cylindrical, elliptical, square or triangular. The outer surface of the annulus is maintained at constant low temperature while the inner wall is maintained at a uniform temperature; higher than the outer one. The enclosure is permeated by a uniform magnetic field having variable orientation. The Brownian motion and thermophoretic deposition 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 find the best performer, the local Nusselt number is demonstrated for different shapes of the inner wall. The heat transfer enhancement for different nanofluids for four different shapes of the inner wall is exhibited.

Keywords : nanofluids, annulus, nonhomogeneous dynamic model, heat transfer
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