Natural convective heat transfer of cobalt-kerosene nanofluid inside a quarter-circular enclosure with uniform and Non-uniform heated bottom wall sing two-component nonhomogeneous model / Md. Shariful Alam

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Abstrak

In this paper, the problem of natural convective heat transfer of kerosene-cobalt nanofluid inside a quarter circular enclosure in the presence of oriented magnetic field has been studied numerically using two-component non-homogeneous model. The round wall of the enclosure is maintained at constant low temperature; the left vertical wall is adiabatic whereas the bottom wall is considered as heated uniformly and non-uniformly. The effects of Brownian motion and thermophoresis are incorporated into the nanofluid model. The Galerkin weighted residual finite element method has been employed to solve the governing partial differential equations after converting them into a non-dimensional form using a suitable transformation of variables. Comparison with previously published work is performed and excellent agreement is obtained. The effects of various model parameters such as Hartmann number, Rayleigh number and magnetic field inclination angle on the streamlines, isotherms and isoconcentrations have been displayed graphically for both uniformly as well as non-uniformly heated bottom wall. In addition, the heat transfer augmentation for various model parameters as well as various thermal boundary conditions have been done in light of the average Nusselt number from the bottom heated wall. The obtained numerical results show that the average Nusselt number is an increasing function of the Rayleigh number, while it is a decreasing function of the Hartmann number.