Enhancement of natural convection flow using nanofluid in an annular space between confocal elliptic cylinders

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Abstract

In the current study, natural convection heat transfer in two-dimensional annulus formed by two differentially heated confocal elliptic cylinders oriented and filled with a nanofluid is studied numerically. Equations of continuity, momentum and energy are formulated using the dimensionless form in elliptic coordinates for laminar two-dimensional, incompressible flow, which is expressed in terms of stream function, vorticity and temperature. Laminar regime is considered under steady state condition. The governing equations are discretized using the control volume method. The numerical simulations covered different parameters such as Rayleigh number; volume fraction of nanoparticles, orientation angles. Results are presented in terms of fluid flow patterns, isotherms, graphs of local and average Nusselt numbers. The results are also discussed in detail and a very good agreement exists between the present results and those from the literature.

Keywords: Numerical simulation,natural convection, confocal elliptic cylinders, nanofluids