Impact of a localized solid cylinder on entropy generation and mixed convection of nanofluids in a lid-driven trapezoidal cavity

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Abstract

The problem of entropy generation and mixed convection in a nanofluid trapezoidal cavity with an internal solid cylinder is studied numerically using the finite difference method. The bottom wall is thermally insulated while the upper wall slides with uniform velocity from left to right and cooled isothermally. Remainder of these walls are kept adiabatic. Water-based nanofluids with \Al2O3 nanoparticles are chosen for the investigation. The Boussinesq approximation is applicable. The influence of Reynolds number, Richardson number, dimensionless radius of the solid cylinder, location of the solid cylinder and nanoparticles of volume fraction on streamlines, isotherms, isentropic as well as the local and average Nusselt number were investigated. It was found that the location and size of the solid cylinder are important control parameters for optimizing heat transfer and Bejan number within the partially heated trapezoid cavity.

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