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Mixed Convection in Superposed Nanofluid and Porous Layers in Square Enclosure with Inner Rotating Cylinder

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Abstract

In this study, numerical simulation of mixed convection in a partitioned square cavity having CuO-Water nanofluid and superposed porous medium with an adiabatic rotating cylinder is performed. The bottom horizontal wall of the cavity is heated and the top horizontal wall is cooled while the remaining vertical walls are insulated. An adiabatic rotating cylinder is located at the center of the square cavity. Galerkin weighted residual finite element method is utilized to solve the governing equations of the system. The influence of of Rayleigh number (between 10^3 and 10^6), angular rotational velocity of the cylinder (between 0 and 6000), solid volume fraction of the nanoparticle (between 0% and 0.05%), Darcy number (between 10^{-5} and 10^{-2}) and three different vertical locations of the cylinder on the fluid flow and heat transfer characteristics are numerically investigated in detail for three different cylinder sizes. It is observed that the averaged heat trans-

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