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Magnetohydrodynamics Natural Convection in a Triangular Cavity Filled with a Cu-Al2O3/Water Hybrid Nanofluid with Localized Heating from below and Internal Heat Generation

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Abstract
This study investigates the convective heat transfer of a hybrid nanofluid filled in a triangular cavity subjected to a constant magnetic field and heated by a constant heat flux element from below. The inclined side of the cavity is cooled isothermally while the remaining sides are thermally insulated. The finite difference method with the stream function-vorticity formulation of the governing equations has been utilized in the numerical solution. The problem is governed by several pertinent parameters namely, the size and position of the heater element, B=0.2-0.8 and D=0.3-0.7, respectively, the Rayleigh number, Ra=102-106, the Hartmann number, Ha=0-100, the volume fraction of the suspended nanoparticles, Φ=0-0.2, and the heat generation parameter Q=0-6. The results show significant effect of increasing the volume fraction of the hybrid nanofluid when the natural convection is very small. Moreover, the hybrid nanofluid composed of equal quantities of Cu and Al2O3 nanoparticles dispersed in water base fluid has no significant enhancement on the mean Nusselt number compared with the regular nanofluid. © 2018 by ASME.

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