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Numerical analysis of unsteady conjugate natural convection of hybrid water-based nanofluid in a semicircular cavity
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Abstract
Unsteady conjugate natural convection in a semicircular cavity with a solid shell of finite thickness filled with a hybrid water-based suspension of Al2O3 and Cu nanoparticles (hybrid nanofluid) has been analyzed numerically. The governing equations for this investigation are formulated in terms of the dimensionless stream function, vorticity, and temperature and have been solved by the finite difference method of the second-order accuracy. The effects of the dimensionless time, Rayleigh number, thermal conductivity ratio, and the nanoparticles volume fraction on the flow patterns and heat transfer have been studied. The obtained results have revealed essential heat transfer enhancement at solid-fluid interface with addition of nanoparticles. In addition, a comparison of the heat transfer enhancement level due to the suspension of various nanoparticles materials (Al2O3 and Cu) in water as regular nanofluids (Al2O3/water and Cu/water) and as a hybrid Al2O3-Cu/water nanofluid is reported. © 2017 by ASME.

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