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Mixed convection in a square cavity filled with CuO-water nanofluid heated by corner heater
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Abstract
This paper investigates the heat transfer and fluid flow in a lid-driven cavity filled with CuO-water nanofluid and heated by a corner heater. The left vertical wall is cooled isothermally and moves upward. The corner heater is configured to be acting in the horizontal and vertical right walls. The remainder walls are adiabatic. Temperature dependent models for thermal conductivity and dynamic viscosity have been invoked. The governing equations have been solved using finite difference method. The governing parameters are nanofluid volume fraction φ = 0.0 – 0.07, Richardson number Ri = 0.01 – 100, Reynolds number (Re = 100 – 300) and five configurations of corner heater governed by the distance of its lower edge Δ = 0 – 1. The results show that for low and intermediate values of Richardson number (i.e., Ri = 0.01 and Ri = 1) the effects of the nanoparticles on heat transfer enhancement is not greatly pronounced. However, for high values of Richardson number (i.e., Ri = 10 and Ri = 100) the Nusselt number enhances due to the addition of nanoparticles. A single case of heat transfer deterioration, due to the presence of nanoparticles, is observed for the case of Ri = 0.01 and Δ = 0. For all studied Richardson numbers, the case of Δ = 0 gives the best scenario for heat transfer when compared to other heater's location. © 2017 Elsevier Ltd

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