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Conjugate Mixed Convection Heat Transfer and Entropy Generation of Cu-Water Nanofluid in an Enclosure with Thick Wavy Bottom Wall

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Abstract : Mixed convection of Cu-water nanofluid in an enclosure with thick wavy bottom wall has been investigated numerically. A co-ordinate transformation method is used to transform the computational domain into an orthogonal co-ordinate system. The governing equations in the computational domain are solved through a pressure correction based iterative algorithm. The fluid flow and heat transfer characteristics are analyzed for a wide range of Richardson number (0.1 ≤ Ri ≤ 5), nanoparticle volume concentration (0.0 ≤ ϕ ≤ 0.2), amplitude (0.0 ≤ α ≤ 0.1) of the wavy thick-bottom wall and the wave number (ω) at a fixed Reynolds number. Obtained results showed that heat transfer rate increases remarkably by adding the nanoparticles. Heat transfer rate is dependent on the wavy wall amplitude and wave number and decreases with increasing Richardson number for fixed amplitude and wave number. The Bejan number and the entropy generation are determined to analyze the thermodynamic optimization of the mixed convection.

Keywords : conjugate heat transfer, mixed convection, nano fluid, wall waviness
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