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Impacts of heated rotating inner cylinder and two-phase nanofluid model on entropy generation and mixed convection in a square cavity
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Abstract
A numerical study is carried out on mixed convection and entropy generation of Al2O3/water nanofluid due to a rotating cylinder inside a square cavity. The numerical computations are performed taking the non-homogenous model of Buongiorno into consideration. The inner moving rotating circular cylinder is maintained at a constant hot temperature Th and the other left and right vertical walls of the cavity are maintained at a constant cold temperature Tc. The bottom and top horizontal walls are maintained as adiabatic. The Galerkin weighted residual method is implemented to numerically solve the governing equations. The Rayleigh number (104 ≤ Ra ≤ 107), angular rotational velocity (0 ≤Ω≤ 600) nanoparticles loading (0 ≤ ϕ ≤ 0.04) and the dimensionless radius of rotating cylinder (0.1 ≤ R ≤ 0.4) are the governing parameters of this study. Numerical results for the streamlines, isotherms, isentropic lines, nanoparticle loading, local and average Nusselt number and Bejan number are obtained and presented graphically. A detailed discussion of the results is performed to highlight the physics of the problem. © 2019, Springer-Verlag GmbH Germany, part of Springer Nature.

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