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Exploration of particle shape effect on Cu-H2O nanoparticles over a moving plate: An approach of dual solution
(2019) *International Journal of Numerical Methods for Heat and Fluid Flow*, .

Abstract
Purpose: This paper aims to explore particle shape effect on Cu-H2O nanoparticles over a moving plate in the presence of nonlinear thermal radiation. To characterize the effect, particle shape and viscous dissipation are considered. Convergent solutions for the resulting nonlinear systems are derived and the effects of embedded parameters of interest on velocity and temperature field are examined. Design/methodology/approach: The Runge–Kutta–Fehlberg fourth-fifth order method along with shooting technique is used to solve the governing equations (6) and (7) with boundary conditions (8). A suitable finite value of η∞ is considered in such a way that the boundary conditions are satisfied asymptotically. Findings: The results show an increase in both the heat transfer and thermodynamic performance of the system. However, among the three nanoparticle shapes, disk shape exhibited better heat transfer characteristics and heat transfer rate. On the other hand, the velocity profile enhances with increasing values of ϕ in the first solution, but the opposite trend was found in the second solution. Originality/value: The present paper deals with an exploration of particle shape effect on Cu-H2O nanoparticles over a moving plate in the presence of nonlinear thermal radiation. To characterize the effect, particle shape and viscous dissipation are considered. Convergent solutions for the resulting nonlinear systems are derived and the effects of embedded parameters of interest on velocity and temperature field are examined. The skin friction coefficient and Nusselt number are numerically tabulated and discussed. The results show an increase in both heat transfer and thermodynamic performance of the system. However, among the three nanoparticle shapes, disk shape exhibited better heat-transfer characteristics and heat-transfer rate. On the other hand, the velocity profile enhances with increasing values of ϕ in the first solution, but the opposite trend was found in the second solution. © 2019, Emerald Publishing Limited.

2-s2.0-85067852399
Document Type: Article
Publication Stage: Article in Press
Source: Scopus

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