Numerical simulation of viscoelastic nanofluid past a horizontal circular cylinder with viscous dissipation

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ABSTRACT
Laminar mixed convection heat transfers of CMC-copper viscoelastic nanofluid past a horizontal circular cylinder was studied with the presence of viscous dissipation. The transformed boundary layer equations for velocity and temperature subject to constant heat flux (CHF) boundary conditions. Keller-box method has been chosen to solved this numerical solution. Simulations were performed for nanoparticle volume fractions up to 3%. Eckert number, viscoelastic parameter, mixed convection parameter and nanoparticles volume fraction are the dimensionless parameters have been studied graphically in terms of velocity and temperature profiles. The physical analysis has been studied and analyzed as well. The results reveals that both nanoparticles volume fraction and viscoelastic parameter show similar behavior in terms of velocity and temperature profiles, which the velocity profiles decrease and the temperature profiles increases when the values of nanoparticles volume fraction and viscoelastic parameter increases. Besides that, increasing Eckert number does not give any effects in velocity and temperature profiles. For the mixed convection parameter, the velocity profiles are increases and temperature profiles is decreases as the value of parameter increased.

KEYWORDS
Dusty Jeffrey fluid; Newtonian heating; Thermal radiation; Two-phase flow

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