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MIXED CONVECTION FLOW OF VISCOELASTIC NANOFLUID PAST A HORIZONTAL CIRCULAR CYLINDER IN PRESENCE OF HEAT GENERATION

Aliran Olakan Campuran Bendalir-nano Likat Kenyal Melepasi Silinder Membulat yang Mengufuk Dengan Kehadiran Penjana Haba

Rahimah Mahat, Noraihan Afiqah Rawi, Abdul Rahman Mohd Kasim, Sharidan Shafie

Abstract

The steady two-dimensional mixed convection boundary layer flow of viscoelastic nanofluid past a horizontal circular cylinder with convective boundary condition in presence of heat generation has been studied numerically. Carboxymethyl cellulose solution (CMC) is chosen as the base fluid and copper as a nanoparticle with the Prandtl number Pr = 6.2. The Tiwari and Das model has been considered in this study. The governing partial differential equations are reduced to a system of ordinary differential equations by introducing similarity transformations. The nonlinear similarity equations are solved numerically by applying the Keller-box method. The numerical results are presented graphically for different values of the parameters including the heat generation parameter, nanoparticles volume fraction, and Biot number. A systematic study is discussed to analyze the effect of these parameters on the velocity and temperature profiles as well as the skin friction and heat transfer coefficient. The thermal boundary layer shows the changes in variation behavior when the nanoparticles volume fraction, heat generation and Biot number are increased. Heat transfer coefficient is increasing function of heat generation parameter. Nanoparticles volume fraction on heat transfer coefficient have opposite effect when compared with heat generation parameter.

Keywords: Mixed convection, viscoelastic, nanofluid, convective boundary condition, heat generation