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Numerical analysis of mixed convection flow past a symmetric cylinder with viscous dissipation in viscoelastic nanofluid

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Authors:

Rahimah Mahat,
Sharidan Shafie,
Fatihhi Januddi,

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Abstract:

Research on the nanofluid becomes trending amongst researchers especially in the industrial and engineering field due to its important and extensive applications. Therefore, the present study aims to investigate numerically the impact of viscous dissipation conducted by sodium carboxymethyl cellulose (CMC-water) nanofluid containing copper nanoparticles at room temperature with convective boundary conditions (CBC). The Tiwari and Das model was selected in this study and the transformed boundary layer equations for momentum and energy subject to the appropriate boundary conditions were numerically solved by employing numerical scheme, namely the Keller-box method. The results were analysed in detail and presented graphically for the velocity, temperature, skin friction coefficient as well as the heat transfer coefficient. The obtained results indicated that there was no significant effect for velocity and temperature profiles when values of Eckert number increased. However, it is significant for skin friction and heat transfer coefficient profiles. In the meantime, the thermal conductivity of the fluid may increase by increasing the concentration of nanofluid.