14

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Thermal radiation effect on Viscoelastic Walters'-B nanofluid flow through a circular cylinder in convective and constant heat flux

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Abstract:
The investigation on flow of nanofluid are well known amongst researchers due to its utilization in the industrial and engineering sector. It is useful for cooling purposes in the electronic devices, which has shown good results in energy saving. Thus, this study focusses on the analysis of radiation effects on mixed convection of Walters'-B nanofluid flow through a circular cylinder in the constant heat flux (CHF) and convective boundary conditions (CBC) horizontally. The sodium carboxymethyl cellulose (CMC-water) nanofluid is considered as conventional fluid containing copper nanoparticles. The numerical method of Keller-box is conducted to simplify the partial differential equations. Graphical profiles are plotted and discussed to examine the impacts of various physicals terms on velocity, skin friction, temperature and thermal transfer. The results discover the fluid velocity and temperature boost for increasing radiation and Biot number caused by the raise of energy supply in the fluid flow. The velocity profile decreases when nanoparticles volume fraction increases as the increment of fluid concentration slowing down the fluid flow. The convective heat transfers and skin friction increases as mixed convection parameter rises by varying the thermal boundary region. Furthermore, the temperature and velocity in CHF condition are comparatively higher than CBC condition.