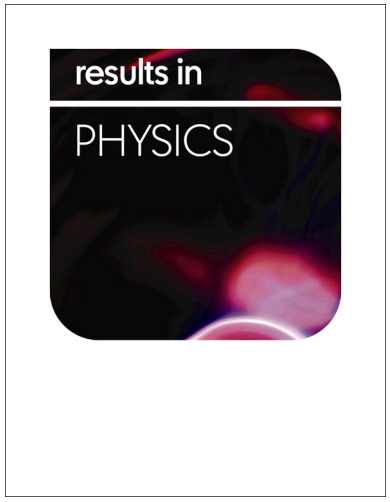

Impacts of variable thermal conductivity on stagnation point boundary layer flow past a Riga plate with variable thickness using generalized Fourier's law

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Impacts of variable thermal conductivity on stagnation point boundary layer flow past a Riga plate with variable thickness using generalized Fourier's law

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Abstract: This article explores the problem of two-dimensional, laminar, steady and boundary layer stagnation point slip flow over a Riga plate. The incompressible upper-convected Maxwell fluid has been considered as a rheological fluid model. The heat transfer characteristics are investigated with generalized Fourier's law. The fluid thermal conductivity is assumed to be temperature dependent in this study. A system of partial differential equations governing the flow of an upper-convected Maxwell fluid, heat and mass transfer using generalized Fourier's law is developed. The main objective of the article is to inspect the impacts of pertinent physical parameters such as the stretching ratio parameter ($0 \leq A \leq 0.3$), Deborah number ($0 \leq \beta \leq 0.6$), thermal relaxation parameter ($0 \leq \gamma \leq 0.5$), wall thickness parameter ($0.1 \leq \alpha \leq 3.5$), slip parameter ($0 \leq R \leq 1.5$), thermal conductivity parameter ($0.1 \leq \delta \leq 1.0$) and modified Hartman number ($0 \leq Q \leq 3$), on the velocity and temperature profiles. Suitable local similarity transformations have been used to get a system of non-linear ODEs from the governing PDEs. The numerical solutions for the dimensionless velocity and temperature distributions have been achieved by employing an effective numerical method called the shooting method. It is seen that the velocity profile shows the reduction in the velocity for the higher values of viscoelastic parameter and the thermal relaxation parameter. In addition, to enhance the reliability at the maximum level of the obtained numerical results by shooting method, a MATLAB built-in solver bvp4c has also been utilized.

Keywords: Riga plate, Non-Fourier theory, Stagnation point, Variable thermal conductivity, Maxwell fluid.

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