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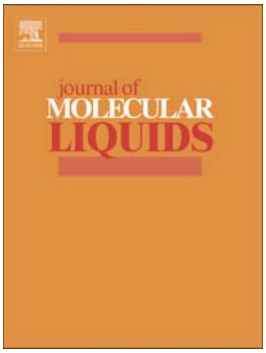

Effect of joule heating and MHD in the presence of convective boundary condition for upper convected Maxwell fluid through wall jet

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Effect of joule heating and MHD in the presence of convective boundary condition for upper convected Maxwell fluid through wall Jet.

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Abstract:

In the present study, the boundary-layer flow of an incompressible upper convected Maxwell fluid through a vertical slit is considered. In addition, the convected boundary condition is applied for the analysis of heat transfer. To attain more insight of the heat transfer problem, the effect of Joule heating is also taken into account. Also, for controlled type of flow, a magnetic field is applied along the y-axis. A reduced form of ordinary differential equations is obtained by applying the boundary-layer approximation theory and similarity transformation. The results are obtained using the numerical Runge–Kutta method coupled with the shooting method. From the investigation, we conclude that the Biot number, magnetic parameter, and βvalues play important roles in increasing the temperature and controlling the fluid velocity through a wall jet, whereas, higher values of local Eckert number to increase the thickness of thermal boundary layer.

Keywords: Boundary layer; Joule heating; Maxwell fluid; Numerical solution; Magnetohydrodynamic; Wall jet.

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