UNIVERSITI TEKNOLOGI MARA

EFFECTS OF VELOCITY SLIP ON UNSTEADY MAXWELL FLUID FLOW OVER A STRETCHING SURFACE

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ABSTRACT

This study investigates the effects of velocity slip on unsteady magnetohydrodynamic (MHD) flow of a Maxwell fluid over a stretching surface, considering thermal radiation, magnetic fields, porosity, and heat generation/absorption. The governing partial differential equations are transformed into nonlinear ordinary differential equations using similarity variables and solved numerically using the Runge-Kutta-Fehlberg (RKF45). Results demonstrate that velocity slip reduces near-surface fluid velocity while slightly increasing heat transfer, magnetic fields enhance flow resistance without significantly affecting thermal profiles, and porosity increases drag while maintaining thermal performance. Additionally, unsteadiness improves heat transfer through enhanced fluid mixing, and higher Prandtl numbers thin the thermal boundary layer for better heat dissipation. The findings are of immense value in the optimization of industrial processes involving viscoelastic fluids, such as polymer processing and thermal management systems, as well as uncover the influence of slip conditions in micro/nanofluidic systems.

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