On the Boundary Layer Flow over a Moving Surface in a Fluid with Temperature-Dependent Viscosity

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Keywords: Flat Moving Surface; Temperature Dependent Viscosity; Self-Similar Equations; Viscous Dissipation

ABSTRACT

This paper examines a boundary layer flow over a continuously moving heated flat surface with velocity $U_{\omega}(x)$ in a streaming flow with velocity $U_{\infty}(x)$ and with temperature dependent viscosity, $\mu(T)$. The momentum and the energy equations are coupled through the viscous dissipation term. The coupled boundary layer equations are transformed into a self-similar form using an appropriate similarity variable. An efficient numerical technique is used to solve the self-similar boundary layer equations. It is shown that at low enough values for the velocity ratio ξ, an increase in viscous dissipation enhances greatly the local heat transfer leading to temperature overshoots adjacent to the wall. The viscosity variation parameter is shown to have significant effects on the temperature dependent viscosity and the velocity and temperature distribution within the boundary layer.