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**Navier’s Slip Condition on Time Dependent Darcy-Forchheimer Nanofluid Using Spectral Relaxation Method**

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**Abstract**

In industrial applications involving metal and polymer sheets, the flow situation is strongly unsteady and the sheet temperature is a mixture of prescribed surface temperature and heat flux. Further, a proper choice of cooling liquid is also an important component of the analysis to achieve better outputs. In this paper, we numerically investigate Darcy-Forchheimer nanoliquid flows past an unsteady stretching surface by incorporating various effects, such as the Brownian and thermophoresis effects, Navier’s slip condition and convective thermal boundary conditions. To solve the governing equations, using suitable similarity transformations, the nonlinear ordinary differential equations are derived and the resulting coupled momentum and energy equations are numerically solved using the spectral relaxation method. Through the systematically numerical investigation, the important physical parameters of the present model are analyzed. We find that the presence of unsteadiness parameter has significant effects on velocity, temperature, concentration fields, the associated heat and mass transport rates. Also, an increase in inertia coefficient and porosity parameter causes an increase in the velocity at the boundary.

**Keywords:**

Darcy-Forchheimer flow, Nanoliquid, Navier’s slip, Convective condition, Numerical solution

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