# Computational Investigation of Hydromagnetic Thermo-Solutal Nanofluid Slip Flow in a Darcian Porous Medium With Zero Mass Flux Boundary Condition Using Stretching Group Transformations

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**ABSTRACT**

In this paper, hydromagnetic thermo-solutal nanofluid flow past a flat plate embedded in a Darcy porous medium has been investigated considering zero mass flux with velocity and thermal slips boundary conditions. The nanofluid flow is considered as 2D, steady state, incompressible, and laminar. We used a generalized stretching group of transformations to develop the similarity solutions of the model. Using these transformations, the transport equations of the nanofluid flow model are reduced to a system of nonlinear ordinary differential equations (ODEs). Finally, the transformed ODEs are computationally solved using MATLAB nonlinear equation solver "fsolve" and ODE solver "ode15s". Solutions are compared with previously available results and the comparison shows good correlation. Furthermore, the computational results are provided to demonstrate the influence of the dimensionless velocity slip parameter, thermal slip parameter, magnetic field parameter, Brownian motion parameter, thermophoresis parameter, and Darcy number on the dimensionless velocity, temperature, and nanoparticle volume fraction (concentration) fields, as well as on the heat transfer rate and skin friction. It was found that the skin friction factor decreases (increases) while the heat transfer rate increases (decreases) with the velocity (thermal) slip parameter. Both the heat transfer rate and the friction factor increase with the magnetic field and Darcy number.

**KEYWORDS**: Darcy porous medium, velocity and thermal slip, zero mass flux, stretching group transformations

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