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RESEARCH PAPERS

Dynamics of Activation Energy and Nonlinear Mixed Convection in Darcy-Forchheimer Radiated Flow of Carreau Nanofluid Near Stagnation Point Region

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Abstract

In this research work, heat and mass transport and radiated, two-dimensional, steady, incompressible nanofluid flow of non-Newtonian material (Carreau fluid) over a stretchable moving surface of sheet is examined. The flow is saturated through Darcy-Forchheimer porous medium and generated by stretching phenomenon. Furthermore, magnetodydrodynamics (MHD), mixed convection, heat generation/absorption, nonlinear thermal radiation, thermophoresis diffusion, activation energy, Brownian motion, and chemical reaction effects are accounted to develop the governing expressions, i.e., momentum, energy, and concentration for the considered flow problem. The governing equations are first altered into nonlinear ordinary differential equations with the help of appropriate similarity variables and then computational results are computed by Built-in-Shooting technique via MATHEMATICA. The salient aspects of sundry variables are discussed graphically on the velocity field, skin friction coefficient, temperature profile, Nusselt number, concentration field, and Sherwood number. Outcomes illustrate that the velocity field and temperature profile have contrast behavior against higher values of magnetic parameter. Also, the engineering quantities are discussed numerically with the help of important flow variables and the results are demonstrated through tables.

Issue Section: Research Papers
Keywords: Darcy-Forchheimer porous medium, Carreau nanofluid, heat generation/absorption, slip velocity, nonlinear mixed convection, thermal radiation, Arrhenius activation energy, stagnation point flow, entropy generation, conduction, forced convection, radiative heat transfer
Topics: Absorption, Diffusion (Physics), Entropy, Flow (Dynamics), Heat, Mixed convection, Nanofluids, Porous materials, Thermal radiation, Temperature, Brownian motion, Dynamics (Mechanics), Fluids, Chemical reactions, Skin friction (Fluid dynamics)

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