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Heat and mass transfer analysis for bioconvective flow of Eyring Powell nanofluid over a Riga surface with nonlinear thermal features

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Abstract

This study aims to explore the rheological consequences of Eyring Powell nanofluid along with the swimming characteristics of gyrotactic microorganisms over the surface of the Riga plate which is embedded in a porous medium. The bioconvection fluid flow phenomenon in the presence of perpendicularly applied magnetic field is investigated. The effects of nonlinear thermal radiation, heat source/sink, and activation energy subject to convective-Nield boundary conditions are utilized in energy and concentration equations. A precise similarity transformation helps us to transform governing partial differential equations into ordinary differential equations and then numerically tackled through a well-known shooting method. The upshots of several pertinent parameters upon the dimensionless profiles of velocity, temperature, concentration, and microorganisms are scrutinized. The heat as well as mass transfer rates and local density number are also calculated. To show the accuracy of the adopted numerical scheme a tabular comparison in limiting case is made between the present results and the results from the literature. Finally, the current study tells us that the pertinent parameters have produced a significant influence on the boundary layer profiles.

KEYWORDS

activation energy, Eyring Powell nanofluid, gyrotactic microorganisms, heat and mass transfer, similarity solution