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Influence of nonlinear radiation on MHD micropolar fluid flow with viscous dissipation

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Abstract

This study takes account of the impact of the convective boundary conditions. The energy equation consists of Joule heating and thermal nonlinear radiation impacts. Contact between the solid and the fluid is also susceptible to a velocity slip. The resultant differential equations system is solved using homotopy analysis method. To find all numerical computations, Mathematica is utilized. The behavior, with graphical results, of pertinent parameters in micropolar fluid flow characteristics is studied. We look at the impact of the material parameter, magnetic parameter, slip parameter, and electrical parameter to grasp the physics of the problem better. Different values of skin friction, wall couple stress, and Nusselt and Sherwood numbers are discussed.

KEYWORDS

HAM, Joule heating, micropolar fluid, nonlinear radiation

1 | INTRODUCTION

Micropolar fluids are polar fluids with no symmetric stress tensor, they have a well-established classical fluids Navier–Stokes model termed ordinary fluids. Fluids comprised of solid random (or spherical) particulate matter, without liquid cell deformation, are suspended in a viscous medium. Micropolar flows include the blood of animals, anisotropic fluids, lubricating flows, complex structural biology, and many polymers.

Eringen[1] initially proposed the idea of the micropolar fluid. Eringen[2] further created a generalized theory of the thermomicrofluid. The new component equation combined the Navier–stokes equation with a new independent vector field microrotating material. Anantha Kumar et al.[3] investigated electromagnetic effects on non-Newtonian fluid. In the unstable

