Thermal aspects of Two-dimensional Magnetic field mixed convection flow of hybrid nanofluid comprising of Silver(Ag), Gold(Au) and motile microorganism over a stretching sheet with the cattaneo - christov model

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Abstract

The current article investigates the effects of magnetic field mixed convection, thermal radiation, chemical reaction, activation energy and heat transfer of a ethylene based hybrid nanofluid provoked by a stretching sheet of porous medium. This research explores the unique properties of hybrid nanofluids (Ag and Au) in the bio-convective flow of gyrotactic microorganisms in Darcy Forchheimer medium. The proposed formulation incorporates the Cattaneo-Christov heat flux model. The highly non-linear system of governing equations is managed by applying suitable similarity transformations to derive a set of ordinary differential equations. These ordinary differential equations are then solved numerically by using the bvp4c technique. The usage of Ag-Au / $C_2H_6O_2$improves thermal properties and increases the volume fraction of hybrid nanoparticles. This study analyses the velocity, concentration, and temperature fields for relevant factors. The graphical representation of important physical parameters, such as skin friction, local Nusselt number, local Sherwood number, and the density of microorganisms are displayed. Our findings suggest that incorporating magnetic field and thermal radiation enhances the dispersion of microorganisms and hybrid nanofluid formation of silver in the base fluid with gyrotactic microorganisms leading to increased rates of heat transfer. Excellent agreement is indicated by a comparative study with previous results**.**

Keywords: Hybrid nanofluid(Ag-Au); mixed convection; Cattaneo - christov heat flux; gyrotactic microorganisms; chemical reaction; thermal radiative