Stratified heat transfer of magneto-tangent hyperbolic bio-nanofluid flow with gyrotactic microorganisms: Keller-Box solution technique

ABSTRACT

The purpose of the present investigation is to examine the heat, mass and microorganism concentration transfer rates in the magnetohydrodynamics (MHD) stratified boundary layer flow of tangent hyperbolic nanofluid past a linearly, uniform stretching surface comprising gyrotactic microorganisms as well as nanoparticles. The governing PDEs with relevant end point conditions are molded into a non-dimensional ordinary differential equation (ODE) form by means of the similarity transformation. The numerical solution of dimensionless problem is acquired within the frame of robust Keller-Box technique. The velocity, temperature, mass and motile microorganism density are investigated graphically within the context of different significant parameters. Numerical results have been inspected via plots and table (namely as the local Nusselt number, the local wall mass flux and the local microorganisms wall flux). This article proves that the energy, concentration and motile microorganism density reduce with increase in thermal, solutal and motile density stratification parameters. The asserted outcomes are beneficial to enhance the cooling and heating processes, energy generation, thermal machines, solar energy systems, industrial processes etc.

Keyword: Gyrotactic microorganisms; Nanofluids; Stratification; MHD; Stretchable sheet; Keller-Box method