ABSTRACT

In this paper, the steady mixed convection boundary layer flow near the lower stagnation point of a horizontal circular cylinder with a constant surface temperature embedded in a porous medium saturated by a nanofluid containing gyrotactic microorganisms in a stream flowing vertically upwards for both cases of a heated and cooled cylinder, is studied numerically. The resulting system of nonlinear ordinary differential equations is solved numerically using an implicit finite-difference scheme known as the Keller box method. By considering the governing parameters, namely the mixed convection parameter $\lambda$, the bioconvection Lewis number $L_b$, the traditional Lewis number $L_e$, the bioconvection Péclet number $P_b$, the buoyancy ratio $N_r$, the bioconvection Rayleigh number $R_b$, the Brownian motion $N_b$ and the thermophoresis $N_t$, the numerical results are obtained and discussed for the skin friction coefficient, the local Nusselt number, the local Sherwood number, the local density number of the motile microorganisms as well as the velocity, temperature, nanoparticles volume fraction and motile microorganisms density profiles.

Keywords: bioconvection; horizontal circular cylinder; lower stagnation point; mixed convection; nanofluid; porous medium

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