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| Title | Energy conservation of nanofluids from a biomagnetic needle in the presence of Stefan blowing: Lie symmetry and numerical simulation | | |
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| Abstract |  |
| Thermal energy management associated with the transmission of heat is one of the main problems in many industrial setups (e.g. pharmaceutical, chemical and food) and bio-engineering devices (e.g. hospital ventilation, heating, cooling devices, heat exchanger and drying food, etc). The current study aims to examine thermo-bioconvection of oxytactic microorganisms taking place in a nanofluid-saturated needle with the magnetic field. Stefan-blowing is applied. The leading equations of continuity, momentum and energy, species transport equations for oxygen concentration and population density of microorganisms are reduced dimensionless and Lie symmetry group transformations are used to generate appropriate invariant transformations. The resulting similarity boundary value problem (in which the blowing parameter is coupled with concentration) have been simulated using **MATLAB** (2015a) bvp5c built in function. The impact of the emerging factors on the nondimensional velocity, temperature, nanoparticle concentration and motile microorganism density functions and their slopes at the wall, are pictured and tabulated. Justification with published results are included. It is found that all physical quantities decrease with Stefan blowing and increase with power law index parameter. With elevation in magnetic field parameter i.e., Lorentzian drag force, the friction factor reduces while the local Nusselt number, local Sherwood number, and the local motile microorganism density wall gradient increase. Present study could be used in food and pharmaceutical industries, chemical processing equipment, fuel cell technology, enhanced oil recovery, etc. | |