Aggregation effects of nanoparticles of Electromagnetohydrodynamic nanofluid flow over an exponential stretching sheet

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1. INTRODUCTION & OBJECTIVE

The scope of nanomaterials can be seen in various engineering and industrial field. The improvement of thermal conductivity of nanofluid is due to inclusion of a certain number of nano particles. Therefore, the aggregation of kinematics of nanoparticles is significant for evaluating the appropriate thermal effect of particles at nano scale. The present study is to investigate the aggregation of nanoparticles of Electromagnetohydrodynamic nanofluid flow over exponential stretching sheet in the presence of convective boundary conditions. The modified Buongiorno model is used to study the fluid flow and heat transport. The governing partial differential conservation equations for mass, momentum, energy are provided into a system and non-linear ordinary differential equations (ODEs) with boundary conditions using appropriate similarity transformations. The shooting technique is utilized along with MATLAB bvp4c-scheme. Copper nano particle has been combined with pure water to form a nanofluid called Cu-water was studied. The effects of Roseland approximations also analysed. The aggregation of nanoparticles is simulated using modified Krieger-Dougherty model for dynamic viscosity and modified Maxwell model for thermal conductivity. Electric parameter, Radiation parameter, Magnetic parameter, Prandtl number Gebhart number on the momentum and heat transports are analysed. Numerical computations are performed for local Sherwood number, Nusselt number and skin friction co-efficient for various physical parameters.

Research aim

Analysing the thermal conductivity of the nano particle volume fraction in the presence of aggregation and the absence of aggregation in velocity and temperature profiles.

Brief Literature survey

Several studies have investigated the impact of varying nanoparticle volume fraction on thermal conductivity of nanofluids with aggregation. For example, Kameswaran et al. [1] Studied the effect of magnetic parameter reducing the velocity of fluid and also observed that the increase in values of M results in thickening the species boundary layer.

Shafiq et al. [2] Investigated the heat transfer mechanism is dominated under the influence of nanoparticle aggregation effect and also this effect has a thinning consequence of the velocity boundary layer patterns.

Loganayagi et al. [3] Analyzed for the nanoparticle volume fraction increasing, temperature increases in both cases of nanofluids and also the heat transfer coefficient decreases for both the nanofluids

2. RESULTS & HIGHLIGHTS OF IMPORTANT POINTS

- The heat transfer mechanism is more presiding under the influence of nanoparticle aggregation effects.
- The velocity profile is decreasing for increasing the values of magnetic parameter in the presence of electric field.
- With an increase in the viscous dissipation parameter raises the fluid temperature in the presence aggregation effect.

References

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