Slip flow of half-and-half-based Ternary Hybrid nanofluid over a moving thin inclined needle with inclined Lorentz force

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ABSTRACT

Purpose:

Ternary hybrid nanofluids have shown promising applications in various fields, especially in the twenty-first century. It shows improved thermal conductivity with inclined needle applications in various industries.

Design/Methodology/Approach:

In IVth-order, the Runge-Kutta method transforms PDE's with slip boundary conditions into ODE's using shooting techniques, obtaining solutions using numerically based methods. Slip conditions (velocity and thermal) have been found for boundary layer flows in stable, incompressible, and natural convection. The existing work analyses ternary hybrid nanofluids free convective boundary layer flow over a moving thin inclined needle with slip flow as a consequence of the inclined Lorentz force.

Findings:

In the ternary hybrid nanofluid flow, which consists of $(Ag, Al, Cu\,(metals))$ and $(Al_2O_3, TiO_2, SiO_2(oxides))$ are nanoparticles, $H_2O - C_2H_6O_2$ (50:50) are considered as the base fluid. From a comparison of metals and oxides, the effect of the governing parameter on the momentum and temperature profile distribution is graphically represented and evaluated to ascertain which is more operative. These analyses demonstrate that increases in the velocity profile magnetic parameter value correspond to a decrease in metals and an increase in oxides. The results of the investigation are compared to those reported in earlier works to determine whether the current results show exceptional promise.

Originality/value:

This research suggests that over a moving thin inclined needle, the effects of inclined Lorentz force in ternary hybrid nanofluid slip flow are important variables that, when utilized by the nanoparticles (metals and oxides), can significantly alter the flow characteristics of the MHD boundary layer in the velocity and thermal profile. The inclined needle can enhance heat transfer efficiency in heat exchangers and electronic cooling systems by delivering a ternary hybrid nanofluid. Combining different nanoparticles creates unique properties and functionalities tailored to specific applications.

Keywords: Inclined needle, slip, Ternary hybrid nanofluid, Inclined Lorentz force

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