Magnetohydrodynamics forced convection boundary layer flow and heat transfer over a moving porous flat in a nanofluid: Dual solutions

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ABSTRACT

The steady two-dimensional forced convection boundary layer flow of an incompressible, viscous and electrically conducting nanofluid over a moving porous flat plate with an applied magnetic field normal to the plate is theoretically studied in this paper. The surface convective boundary condition is considered for the energy equation. Three different types of nanoparticles: copper (Cu), alumina (Al_2O_3) and titania (TiO_2) based water fluid with the Prandtl number $\Pr = 6.2$ are considered. The partial differential equations are transformed into ordinary differential or similarity equations. Numerical results of these equations are presented to show the effect of the nanoparticle volume fraction parameter ϕ, the convective heat transfer parameter b, the power law exponent n, the moving wall parameter λ and the suction parameter f_w on the velocity and temperature profiles as well as on the skin friction coefficient and on the local Nusselt number. The results indicate that dual solutions exist when the plate and the free stream move in the opposite directions. Comparisons with published results are also presented.

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