عنوان مقاله:

Free Convection Flow and Heat Transfer of Tangent Hyperbolic past a Vertical Porous Plate with Partial Slip

نویسندگان:

V. Ramachandra Prasad - *Department of Mathematics, Madanapalle Institute of Technology and Science, Madanapalle-۵۱۷۳۲, India*

S. Abdul Gaffar - *Department of Mathematics, Salalah College of Technology, Salalah, Oman*

O. Anwar Beg - *Gort Engovation Research (Aerospace), ۱۵ Southmere Avenue, Great Horton, Bradford, BD۷ ۳Nu, West Yorkshire, UK*

خلاصه مقاله:

This article presents the nonlinear free convection boundary layer flow and heat transfer of an incompressible Tangent Hyperbolic non-Newtonian fluid from a vertical porous plate with velocity slip and thermal jump effects. The transformed conservation equations are solved numerically subject to physically appropriate boundary conditions using a second-order accurate implicit finite-difference Keller Box technique. The numerical code is validated with previous studies. The influence of a number of emerging non-dimensional parameters, namely the Weissenberg number (We), the power law index (n), Velocity slip (Sf), Thermal jump (ST), Prandtl number (Pr) and dimensionless tangential coordinate () on velocity and temperature evolution in the boundary layer regime are examined in detail. Furthermore, the effects of these parameters on surface heat transfer rate and local skin friction are also investigated. Validation with earlier Newtonian studies is presented and excellent correlation achieved. It is found that velocity, skin friction and heat transfer rate (Nusselt number) is increased with increasing Weissenberg number (We), whereas the temperature is decreased. Increasing power law index (n) enhances velocity and heat transfer rate but decreases temperature and skin friction. An increase in Thermal jump (ST) is observed to decrease velocity, temperature, local skin friction and Nusselt number. Increasing Velocity slip (Sf) is observed to increase velocity and heat transfer rate but decreases temperature and local skin friction. An increasing Prandtl number, (Pr), is found to decrease both velocity and temperature. The study is relevant to chemical materials processing applications.

کلمات کلیدی:

Non, Thermal jump, newtonian tangent hyperbolic fluid, Skin friction, Boundary layer flow, Nusselt number, Weissenberg number, Power law index, Velocity slip

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