



Influence of yield stress on free convective boundary-layer flow of a non-Newtonian nanofluid past a vertical plate in a porous medium

F. M. Hady¹, F. S. Ibrahim¹, S. M. Abdel-Gaied² and M. R. Eid²

Abstract:

The effect of yield stress on the free convective heat transfer of dilute liquid suspensions of nanofluids flowing on a vertical plate saturated in porous medium under laminar conditions is investigated considering the nanofluid obeys the mathematical model of power-law. The model used for non-Newtonian nanofluid incorporates the effects of Brownian motion and thermophoresis. The governing boundary-layer equations are cast into dimensionless system which is solved numerically using a deferred correction technique and Newton iteration. This solution depends on yield stress parameter τ_0 , a power-law index n , Lewis number Le , a buoyancy-ratio number Nr , a Brownian motion number Nb , and a thermophoresis number Nt . Analyses of the results found that the reduced Nusselt and Sherwood numbers are decreasing functions of the higher yield stress parameter for each dimensionless numbers, n and Le , except the reduced Sherwood number is an increasing function of higher Nb for different values of yield stress parameter

Keywords:

Non-Newtonian; Free convection; Nanofluid; Porous media; Yield stress

Published In:

Journal of Mechanical Science and Technology 25 (8) (2011) 1~8 , 25 (8) , 1~8