

Stagnation point flow over a stretching or shrinking cylinder in a copper-water nanofluid

ABSTRACT

The problem of steady stagnation-point flow over a stretching or shrinking cylinder in a water-based Copper (Cu) nanofluid is considered in this study. The governing partial differential equations in cylindrical form are reduced to ordinary differential equations using a similarity transformation. The resulting system is solved numerically by using shooting method with Prandtl number $Pr = 6.2$. The skin friction coefficient, Nusselt number, and the velocity and temperature profiles are presented graphically and discussed. The governing equation of the problem shows that the flow and heat transfer characteristics depend on the effects of the curvature parameter, stretching or shrinking parameter and nanoparticle volume fraction parameter. It is found that the solutions for a shrinking cylinder are non-unique which differ from a stretching cylinder. It is observed that the surface shear stress and the heat transfer rate at the surface increase as the curvature parameter increases.

Keyword: Boundary layer; Dual solutions; Nanofluid; Stagnation point; Stretching or shrinking cylinder