Numerical solution of stagnation point flow and heat transfer over a nonlinear stretching/shrinking sheet in hybrid nanofluid: stability analysis

ABSTRACT

The steady, laminar, stagnation point flow of hybrid nanofluid past a nonlinearly stretching and shrinking sheet is studied. Hybrid nanofluid is regarded by disseminated two distinct nano-sized particles, silver (Ag) and copper oxide (CuO) in pure water. Similarity technique was used for the transformation of partial differential equations (PDEs) into an ordinary differential equations (ODEs). Obtained ODEs were solved using Matlab's built in function (bvp4c). The results of important governing parameters which are nonlinear parameter, stretching/shrinking parameter and nanoparticle volume fraction are evaluated and discussed in graphical and tabular form for the velocity and temperature profiles, along with local skin friction, local Nusselt number. Nonunique solutions (first and second branch) are visible for some limit of shrinking parameter. It is noticed that nonlinear parameter hastens flow separations. Hence, a stability analysis is executed to identify which solutions are stable and physically feasible.

Keyword: Hybrid nanofluid; Onlinear stretching/shrinking; Stagnation point; Stability analysis