Mixed convection flow and heat transfer of carbon nanotubes over an exponentially stretching/shrinking sheet with suction and slip effect

ABSTRACT

The steady two-dimensional mixed convection boundary layer flow and heat transfer of carbon nanotubes (CNTs) over an exponentially stretching/shrinking sheet with suction and slip is studied numerically. Water (base fluid) along with two types of CNTs, namely single and multi-walled CNTs are taken into consideration. Stretching/shrinking velocity and wall temperature are assumed to vary as prescribed exponential functions. The governing boundary layer equations of the problem are transformed into an ordinary differential equation via exponential similarity transformation. The resulting ordinary differential equations are solved numerically using the bvp4c package in Matlab software. The effects of governing parameters, namely, mixed convection parameter, exponentially stretching/shrinking parameter, nanoparticle volume fraction parameter, slip parameter and suction parameter on dimensionless velocity, temperature, skin friction coefficients and Nusselt numbers are discussed and presented graphically in detail. It has been found that dual solutions exist for an exponentially stretching and shrinking sheets.

Keyword: Carbon nanotubes; Dual solutions; Exponential stretching/shrinking; Heat transfer; Mixed convection