

Similarity solution of marangoni convection boundary layer flow over a flat surface in a nanofluid

ABSTRACT

The problem of steady Marangoni boundary layer flow and heat transfer over a flat plate in a nanofluid is studied using different types of nanoparticles. The general governing partial differential equations are transformed into a set of two nonlinear ordinary differential equations using unique similarity transformation. Numerical solutions of the similarity equations are obtained using the Runge-Kutta-Fehlberg (RKF) method. Three different types of nanoparticles are considered, namely, Cu, Al₂O₃, and TiO₂, by using water as a base fluid with Prandtl number $Pr=6.2$. The effects of the nanoparticle volume fraction ϕ and the constant exponent m on the flow and heat transfer characteristics are obtained and discussed.

Keyword: Marangoni convection; Boundary layer; Nanofluid.