Documents

Zargartalebi, H., Ghalambaz, M., Noghrehabadi, A., Chamkha, A.

Stagnation-point heat transfer of nanofluids toward stretching sheets with variable thermo-physical properties
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Abstract
The objective of this study is to investigate stagnation-point flow of nanofluids over an isothermal stretching sheet. The volume fraction of nanoparticles at the sheet is assumed to be passively controlled. Furthermore, due to low volume fraction of nanoparticles and dilute nanofluid, the thermal conductivity and dynamic viscosity of the nanofluid are assumed to be linear functions of the volume fraction of nanoparticles. In order to study the effects of a plethora of parameters on the boundary layer flow and heat and mass transfer, a practical range of these parameters have been utilized. An accurate numerical solution of the governing equations based on the finite difference method is obtained and the effect of various physical parameters such as the Prandtl number, Lewis number, thermophoresis parameter, and the Brownian motion parameter on the thermal, hydrodynamic, and concentration boundary layers is evaluated. In order to examine the alteration of the thermal convective coefficient, a dimensionless heat transfer enhancement ratio parameter is introduced. The results show that the variation of different thermodynamic parameters induces substantial impression on the behavior of the nanoparticles distribution. For example, it is found that an increase in the value of the Lewis number leads to a decrease in the value of the non-dimensional nanoparticles volume fraction at the sheet, but it does not have any influence on the thermal and hydrodynamic boundary layers. Increasing the Prandtl number is predicted to decrease the thermal boundary layer thickness and the volume fraction of nanoparticles at the surface. In most instances, the heat transfer augments in the presence of nanoparticles.

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