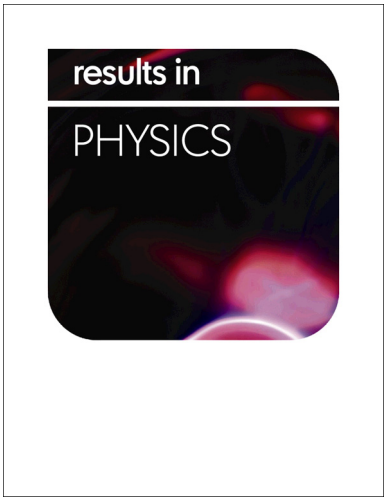

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Heat transfer analysis of Prandtl liquid nanofluid in the presence of homogeneous-heterogeneous reactions

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Abstract

The objective of present research work is to analyze the homogeneous-heterogeneous reactions on the MHD two-dimensional stagnation-point flow of non-Newtonian Prandtl fluid flow and heat transfer towards horizontal linear stretching sheet. The governing boundary layer equations using similarity transformation are reduced to ordinary differential equations suitable to be solved using Finite Difference Method. The quantities of interests are thoroughly analyzed under the effects of various emerging parameters. Comparison of the results obtained from limiting case of present model with already existing literature is in good agreement which shows the validity of the present numerical solution. The study concludes that homogeneous and heterogeneous reaction strength decreases the heat transfer rate. On the other hand, Prandtl fluid parameter and elastic parameter increases heat transfer rate.

Keywords: Homogenous-heterogeneous reactions, nanoparticles, Prandtl fluid, stretching sheet, numerical solution.

1. Introduction

Two main classifications of fluids are Newtonian and non-Newtonian. The later differs from the former in the sense that it does not obey the Newton's law of viscosity. Such types of fluids are encountered by us in our daily life. Honey, paint, toothpaste and fresh concrete are among few of them. For further insight into the study of non-Newtonian fluids and its applications the readers are referred to read the book of [1]. So far, the researchers have been engaged in both experimental and mathematical investigation. In present paper we shall present the brief review of various kinds of non-Newtonian models that have been under consideration. Moreover, as a scope of this paper, we shall stick to the non-Newtonian fluid flow over different kinds of stretching surface. The non-Newtonian fluids under investigation are Sisko fluid [2], Casson fluid [3-4], Carreau fluid [5], Maxwell fluid [6], Williamson fluid [7], Oldroyd-B fluid [8], Jeffery fluid [9], second-grade fluid [10].

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