Impact of nonlinear thermal radiation on stagnation-point flow of a Carreau nanofluid past a nonlinear stretching sheet with binary chemical reaction and activation energy

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Abstract

This research peruses the characteristics of nanoparticles on stagnation point flow of a generalized Newtonian Carreau fluid past a nonlinear stretching sheet with nonlinear thermal radiation. The process of mass transfer is modeled using activation energy and binary chemical reaction along with the Brownian motion and thermophoresis. For energy activation a modified Arrhenius function is invoked. With regard to the solution of the governing differential equations, suitable transformation variables are used to obtain the system of nonlinear ordinary differential equations before being numerically solved using the shooting method. Graphical results are shown in order to scrutinize the behavior of pertinent parameters on velocity, temperature profiles, and concentration of nanoparticle. Also, the behavior of fluid flow is investigated through the coefficient of the skin friction, Nusselt number, Sherwood number, and streamlines. Results showed that the velocity ratio parameter serves to increase the velocity of fluid and reduces the temperature distribution and nanoparticle concentration. The results were compared with the available studies and were found to be in excellent agreement.

Keywords

Author Keywords: Carreau fluid; nanofluid; nonlinear thermal radiation; binary chemical reaction; activation energy; nonlinear stretching sheet

KeyWords Plus: BOUNDARY-LAYER; MASS-TRANSFER; FLUID; SURFACE

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