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Nonlinear radiation effect on casson nanofluid past a plate immersed in darcy-brinkman porous medium with binary chemical reaction and activation energy

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Abstract
Original Manuscript Submitted: 1/19/2017; Final Draft Received: 4/17/2017Nonlinear thermal radiation near a stagnation point of Casson nanofluid over a plate in a Darcy-Brinkman porous medium is considered. Combined effects of binary chemical reaction with activation energy are taken into account. For activation energy and thermal radiation a modified Arrhenius function and different type of Rosseland approximation are used. Similarity transformation is invoked to transform the governing equations including momentum, energy, and concentration into a system of highly nonlinear ordinary differential equations and solved numerically using a shooting method. Graphical results are shown in order to scrutinize the behavior of pertinent parameters on velocity, temperature, and concentration of nanoparticle. Also, the behavior of fluid flow is investigated through the coefficient of skin friction, the Nusselt number, the Sherwood number, and streamlines. It is observed that the thickness of the concentration boundary layer increases due to activation energy and decreases due to reaction rate and temperature differences. Finally, a comparative analysis is made through previous studies in limiting case.

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