

Third-grade fluid influenced by Cattaneo-Christov dual diffusion with chemical reaction and variable mass diffusivity over a stretching sheet.

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Abstract:

The non-Newtonian third-grade fluid flowing across a stretching sheet is studied with regard to the chemical reaction effect. A fluid in a double-diffusive convection flow experiences the Cattaneo-Christov effect. The equations corresponding to the flow are partial differential equations that can be converted to ODEs using suitable similarity transformations. Coupled ODEs are numerically solved using the Matlab built-in `bvp4c` approach. To demonstrate how non-dimensional parameters including Prandtl number, Schmidt number, etc. affect fluid velocity, temperature, nanoparticle, and concentration, solutions are shown through graphs and tables. Physical factors such as skin friction, the Nusselt number, and the Sherwood number are displayed in tables. When the current results are compared to earlier studies on third-grade fluid, a good agreement is observed.

Keywords: double-diffusion, third-grade fluid, chemical reaction, stretching sheet, skin-friction.