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RESEARCH ARTICLE

Passive control nanoparticles in double-diffusive free convection nanofluid flow over an inclined permeable plate

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Abstract

The present study has been conducted to acquire the solutions for the flow problem of an incompressible nanofluid past a permeable inclined plate implanted in a porous medium. In this study, double-diffusivity, Brownian motion, and thermophoresis as well as passive control nanoparticles have been studied. We employ Lie group transformation on the ruling equations to extract nonlinear ordinary differential equations and solve them numerically using the fourth-order Runge-Kutta method and shooting approach. The supremacy of affined parameters on temperature and velocity distributions has been exposed by means of tables and graphs. This investigation suggests that both fluid velocity and nanoparticle concentration are enhanced by the modified Dufour parameter and the thermophoresis parameter. The assistance of the Lewis number intensifies the heat transport for suction.

KEYWORDS

Brownian motion, double diffusion, nanofluid, passive control, suction/injection, thermophoresis

1 | INTRODUCTION

Fluids perform as an important role in various divisions of engineering and science that are related to heat transport. Regular fluids (eg, water, oil, and so forth), which are usually used in the cooling system, power reproduction, micro-electronics, chemical production, and so forth, are of very low thermal conductivity, and poorly affect the heat transport progression. Accordingly, this needs more improvement of the thermal conductive nature. Choi[1] deliberated

