Unsteady Natural Convective Nanofluids Over a Vertical Cone: Effects of Soret and Dufour Phenomena with Heat source/sink

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Abstract

Nanofluids are at the forefront of technological advancements and outperform standard fluids in terms of environmental sustainability. This article embarks on a pioneering journey into the numerical simulation of unsteady magnetohydrodynamic natural convective nanofluids laden with nanoparticles. These fluids flowing over a vertical cone, are compelling the impacts of Soret and Dufour phenomena with heat generation/absorption. The equations also account for the enticing interaction of thermophoresis and Brownian motion. Then, the derived model equations underwent a mathematical transformation to a nondimensional form through a prescribed procedure. The resulting set of nondimensional partial differential equations has been solved utilizing the implicit Crank-Nicholson scheme. Afterward, the acquired findings were visually showcased, having undergone a stability examination with graphical depictions. These findings clearly demonstrate the effects of dimensionless factors, highlighting the importance of the Soret number, Dufour number, heat generation/absorption Parameter, thermophoresis parameter, and Brownian motion parameters.

Keywords: Heat source/sink, Nanofluid, Soret and Dufour Effects, Unsteady.