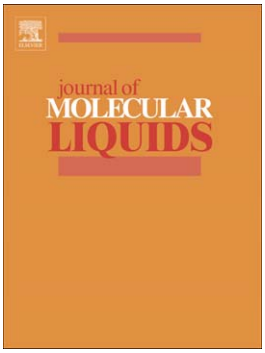

A revised model to study the rotating flow of nanofluid over an exponentially deforming sheet: Numerical solutions

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A revised model to study the rotating flow of nanofluid over an exponentially deforming sheet: Numerical solutions

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Abstract: An attempt has been made to explore the rotational effects on nanofluid flow driven by an exponentially stretched surface. Buongiorno model, preserving the novel Brownian motion and thermophoresis effects, has been employed here. Moreover, recently developed condition of zero normal flux of nanoparticles is taken into account. Heat transfer effects are inspected under practically useful convective surface condition. Traditional boundary layer approximations are invoked to simplify the governing mathematical model. Equations governing the locally similar flow have been solved by a numerical scheme. The solutions are dependent on various dimensionless numbers including the local rotation parameter Ω, the Prandtl number Pr, the Schmidt number Sc, the Brownian diffusion parameter Nb, the thermophoretic diffusion parameter Nt and the Biot number γ. We found that the minimum force required to initiate the fluid motion increases with an increment in local rotation parameter Ω. For larger values of Ω, the velocity profiles oscillatory decay to the free stream conditions. Temperature profiles as well as the wall heat transfer coefficient are marginally affected with the variation in Brownian motion strength. Thermophoretic force has an adverse influence on the wall heat transfer coefficient. Present findings are consistent with those of the already published articles in a limiting situation.

Keywords: Stretching wall; Rotating nanofluid; Brownian motion; Nanoparticle; Buongiorno model; Nonlinear problem; Shooting method

1. Introduction