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Comparative analysis of Powell-Eyring, Maxwell, CuO-blood-based nanofluids flow over a melting stretchable surface with non-linear radiation and viscous effect

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ABSTRACT

This proposed mathematical model investigates the comparative outcomes for momentum and heat transfer behavior of CuO-blood-based nanofluid, Maxwell, and Powell-Eyring nanofluids over a melting stretching surface. The study takes into consideration the presence of an applied magnetic field, viscous dissipation effects, and non-linear thermal radiation. By adopting local similarity variables, the set of nonlinear differential equations is transformed into nonlinear ordinary differential equations, which are subsequently solved numerically using the shooting scheme based on the Runge-Kutta procedure. The controlling parameters, i.e., Eckert number, radiation, temperature ratio, Prandtl number, etc. are adjusted within acceptable ranges. To validate the theoretical findings of this investigation, MATLAB's inbuilt program bvp4c is applied. The graphical analysis is presented to explore the influence of dimensionless parameters on momentum and heat transfer profiles. The rate of heat transfer and skin friction coefficient of the proposed model is calculated and discussed.

Keywords: Powell-Eyring fluid, Maxwell fluid, nanofluid, Melting heat, non-linear radiation, bvp4c.

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