Numerical study on heat transfer and MHD flow of Maxwell hybrid nanofluid: A Caputo time fractional derivative model

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ABSTRACT:

The present mathematical framework theoretically investigates the impact of the fractional model on heat transfer advancement in mixed convection magnetohydrodynamics Maxwell hybrid nanofluid flow through a bi-directional stretching sheet. A Caputo-time derivative model is adopted in the work to inspect the behavior of fractional parameters on flow and heat transfer properties. Nanoparticles like copper and titanium dioxide, and base fluid water is considered for the formation of a hybrid nanofluid. Also, magnetic, buoyancy, and heating effects are considered. System of non-linear coupled governing equations with the model of Caputo-time fractional derivative subjected to non-dimensional forms by inserting appropriate non dimensional quantities. Numerical results for the developing non-linear problem are acquired using a finite difference approximation technique together with the L1 algorithm. The impact of involved flow influential elements on heat transfer and flow characteristics are analyzed and portrayed graphically. From the study it is noted that the strengthening of fluid flow of hybrid nanofluid is directly correlated with the order of fractional derivatives and the reverse trend is observed in thermal distribution.

KEYWORDS: Maxwell hybrid nanofluid, Finite difference method, Fractional model, Relaxation times, Magnetohydrodynamics