Heat and mass transfer analysis of radiative MHD Jeffrey hybrid nanofluid flow over a stretching surface with Soret and Dufour effects

Santhosh Kathuroju[1], Odelu Ojjela[1]*

[1]School of Computer Engineering & Mathematical Sciences,

Defence Institute of Advanced Technology

(Deemed to be University), Pune-411025, India.

Abstract

Hybrid nanofluids have gained significant attention in advanced heat transfer technologies and heat exchangers due to their superior thermal conductivity and economic efficiency compared to monotype nanofluids. This research investigates the combined impact of Soret and Dufour on the unsteady magnetohydrodynamics boundary layer flow of a Jeffrey hybrid nanofluid over a stretching surface with thermal radiation. The hybrid nanofluid comprises ethylene glycol (EG) as the base fluid enriched with copper oxide nanoparticles (CuO) and multi-walled carbon nanotubes (MWCNTs). By employing similarity transformation, the governing equations are transformed into a set of non-linear ordinary differential equations, which are then numerically solved using the shooting method in conjunction with the fourth-order Runge-Kutta method. The numerical results are presented graphically for the CuO-MWCNTs/EG hybrid nanofluid, and these outcomes are extensively discussed to analyze the influence of various thermofluidic parameters on the heat, mass, and flow characteristics of the Jeffrey hybrid nanofluid.

Keywords: Soret and Dufour effects, Thermal radiation, MHD, Jeffrey fluid, Stretching sheet.

***Corresponding author E-mail :** [1*]odelu3@yahoo.co.in; [1*]odelu@diat.ac.in .

Author E-mail : [1] santhoshkathuroju1729@gmail.com.