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Flow and Heat Transfer Analysis of Copper-Water Nanofluid with Temperature Dependent Viscosity past a Riga Plate

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Abstract : Flow of electrically conducting nanofluids is of pivotal importance in countless industrial and medical appliances. Fluctuations in thermophysical properties of such fluids due to variations in temperature have not received due attention in the available literature. Present investigation aims to fill this void by analyzing the flow of copper-water nanofluid with temperature dependent viscosity past a Riga plate. Strong wall suction and viscous dissipation have also been taken into account. Numerical solutions for the resulting nonlinear system have been obtained. Results are presented in the graphical and tabular format in order to facilitate the physical analysis. An estimated expression for skin friction coefficient and Nusselt number are obtained by performing linear regression on numerical data for embedded parameters. Results indicate that the temperature dependent viscosity alters the velocity, as well as the temperature of the nanofluid and, is of considerable importance in the processes where high accuracy is desired. Addition of copper nanoparticles makes the momentum boundary layer thinner whereas viscosity parameter does not affect the boundary layer thickness. Moreover, the regression expressions indicate that magnitude of rate of change in effective skin friction coefficient and Nusselt number with respect to nanoparticles volume fraction is prominent when compared with the rate of change with variable viscosity parameter and modified Hartmann number.

Keywords : heat transfer, peristaltic flows, radially varying magnetic field, curved channel
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