Comparative study of radiative heat transfer of Marangoni flow of $\gamma$-Al$_2$O$_3$ nanofluids in a permeable medium

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Abstract

Present analysis based upon the Marangoni convection of the nanofluid past a linearly expanding sheet with the help of convective heat transfer properties. Considering the base fluids as Ethylene glycol ($C_2H_6O_2$) and Water ($H_2O$) the $\gamma$ - Al$_2$O$_3$ nanoparticle is submerged into it to carry over the flow phenomena. The characteristics of the flow across a permeable medium under nonlinear thermal radiation, that influences the heat transport properties of nanofluid are studied. This research was motivated by the growing significance of nanofluids in numerous scientific and technical domains due to their distinctive and diverse applications and efficient thermal activities. Magnetic refrigeration, medication delivery, cancer treatment, and magnetic resonance imaging (MRI) are a few examples of potential uses for these fluids. The given flow problem is simulated using nonlinear partial differential equations (PDEs) in accordance with the laws of momentum and energy conservation. The resulting PDEs are converted into nonlinear ODEs with smaller dimensions by applying a similarity transformation. The influences of the controlling parameters on the flow model along with the rate coefficients are obtained via graphs. Significant increase in nanofluid temperature is marked in case of water-based nanofluid for the augmentation in water-base fluid further opposite impact is rendered in case of EG-based nanofluid.

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