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Irreversibility analysis of the three dimensional flow of carbon nanotubes due to nonlinear thermal radiation and quartic chemical reactions
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Abstract

In this work, three dimensional flow of a fluctuating nanofluid is examined in moving (rotating) coordinates. Carbon nanotubes (multi-wall carbon nanotubes (MWCNTs)/single-wall carbon nanotubes (SWCNTs)) are taken as nanoparticles whereas water is considered as the base fluid. Xue's model for effective thermal conductivity (carbon nanotube based composite) is utilized. Entropy generation is analyzed in the presence of both homogeneous and heterogeneous mass concentrations. The dimensionless variables are introduced to obtain the dimensionless form of the boundary layer equations along with the entropy augmentation equation. Equations are then solved using an explicit scheme based on the finite differences, and the behaviour of the entropy augmentation, Bejan number and temperature is elaborated. The effects of various dimensionless parameters such as Reynolds number, Brinkman number and radiation parameter on the entropy augmentation rate, and Bejan number are presented graphically for MWCNTs and SWCNTs. Variation in the engineering coefficients (Nusselt number, skin friction, Sherwood number) are shown with various emerging parameters for MWCNTs and SWCNTs. It is found that the entropy augmentation rate can be controlled by minimizing the action of the Brinkman and Reynolds numbers. The results also reveal that the heat transfer (rate) is bigger for SWCNTs in relation to MWCNTs. © 2018

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