Kumar, A.; Singh, R.; Tripathi, R.
Heat transfer analysis of CNT-nanofluid between two rotating plates in the presence of viscous dissipation effect. (English) [Zbl 1441.80002]

Summary: In this research study, an investigation of three-dimensional (3D) CNT based nanofluid flow through a horizontal rotating channel under the influence of viscous dissipation, is carried out. We have considered that the upper sheet of the channel is permeable and fixed while the lower sheet is impermeable and the sole reason for fluid flow initiation is the stretching of the lower sheet. The mathematical model of the problem is developed and is presented in the form of a system of nonlinear partial differential equations. Suitable similarity technique is employed to transform these governing partial differential equations into the set of ordinary differential equations which are nonlinear. The transformed equations are then solved numerically by the bvp4c routine of MATLAB. Computations for the nanofluid velocity and nanofluid temperature along with skin friction coefficient and Nusselt number are, carried out for relevant flow parameters. A comparative analysis of single-wall carbon nanotubes as well as multiwall carbon nanotubes on temperature and velocity distribution is carried out. Three dimensional flow of CNT-based nanofluid inside a horizontal channel whose one wall is permeable and the other is not, has not been considered before. Although up to some extent, such an analysis has practical bearings in the industries related with lubrication under the influence of magnetic field. The temperature of the fluid is getting increased with growing values of Eckert number and rotation parameter while a completely opposite trend is found for suction/injection and Reynolds number.

For the entire collection see [Zbl 1444.00036].

MSC:
80A19 Diffusive and convective heat and mass transfer, heat flow
76D08 Lubrication theory
76U05 General theory of rotating fluids
76W05 Magnetohydrodynamics and electrohydrodynamics
82D80 Statistical mechanics of nanostructures and nanoparticles
65L10 Numerical solution of boundary value problems involving ordinary differential equations

Keywords:
single wall carbon nanotube (SWCNT); multiple wall nanotube (MWCNT); rotating channel; viscous dissipation

Full Text: DOI

References:


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