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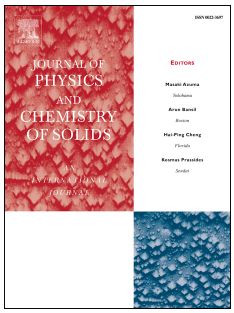

Darcy–Forchheimer squeezed flow of carbon nanotubes with thermal radiation

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Darcy–Forchheimer squeezed flow of carbon nanotubes with thermal radiation

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Abstract: In this study, we analyze the squeezing flow of water-based carbon nanotubes as a Darcy–Forchheimer porous medium with thermal radiation. The Xue model is used for nanoliquid transport phenomena. The nonlinear Darcy–Forchheimer expression is considered. Results are obtained and compared for single-walled carbon nanotubes and multi-walled carbon nanotubes. Appropriate transformations are employed to obtain nonlinear ordinary differential system. The nonlinear system obtained is solved for convergent solutions. Graphs are produced to examine the effects of emerging flow variables on the velocity and temperature. Numerical computations are performed to analyze the skin friction coefficients and local Nusselt numbers. Moreover, we show that the skin friction coefficients and local Nusselt numbers are enhanced at the lower and upper walls for larger values of the nanoparticle volume fraction.

Keywords: Carbon nanotube; Darcy–Forchheimer porous medium; Parallel plate; Squeezing flow; Thermal radiation.

1 Introduction

The squeezing flow between two parallel walls is of great interest to scientists and engineers due to its presence in engineering and industrial applications, such as liquid–metal lubrication, food and polymer industries, compression and injection shaping, and lubrication systems. This issue was first addressed by Stefan [1]. Leider and Bird [2] then analyzed the squeezing flow of a power-law fluid between two parallel disks. The influence of suction/blowing on the squeezed flow was examined by Hamza and MacDonald [3]. Chamkha et al. [4] discussed the fully developed free convection flow of a micropolar fluid in a vertical

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