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Analytical Investigation of Heat Transfer in Micropolar Nanofluids With Suspension of Multi-Wall Carbon Nanotubes in the Presence of Viscous Dissipation

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EXTENDED ABSTRACT

The poor heat transfer properties of conventional fluids was identified as a major obstacle to the high compactness and effectiveness of heat exchangers. The concept of nanofluid [1] has been proposed as a route for surpassing the performance of heat transfer rate in fluids currently available. Nanofluids are a new class of heat transfer fluids containing a submicronic solid particles (1-100 nm) that are uniformly and stably suspended in a liquid. However, the classical nanofluid models have some drastic limitations, i.e. they cannot describe a class of fluids that have certain microscopic characters arising from the microrotation and local structure of the fluid elements [2]. Therefore, the present study discusses the effect of such types of characteristics on the flow and heat transfer of nanofluids. More exactly, our interest is to study the heat transfer flow of multi-wall carbon nanotubes (MWCNTs) suspended micropolar nanofluid past a stretching surface with viscous dissipation. Two different kinds of base fluids (engine oil and kerosene) having poor thermal conductivity as compared to carbon nanotubes are used in this analysis. The governing equations are solved analytically and the solutions are presented in closed form. Solutions for conventional or regular nanofluid is also recovered as a special case. From graphical results, it is found that temperature of MWCNTs suspended micropolar nanofluid is higher than conventional micropolar fluid.

Keywords: Micropolar Nanofluids; Carbon Nanotubes; Viscous Dissipation; Exact Solutions.

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References
[1] Choi, S. (1995) Enhancing thermal conductivity of fluids with nanoparticles, Developments and applications of non-Newtonian flows. In: D.A. Siginer, H.P. Wang, editors, ASME, 66:99-105.
[2] Eringen, A. C. (1966) Theory of micropolar fluids. Journal of Applied Mathematics and Mechanics 16:1-18.