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Convection heat transfer in micropolar nanofluids with oxide nanoparticles in water, kerosene and engine oil

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ABSTRACT

The basic idea of nanofluid was to enhance the thermal conductivity of base fluid. 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. Therefore, the present work is one of the infrequent contributions that describes the microrotation and microinertia characteristics of nanofluids. More exactly, in this work, the unsteady free convection flow of micropolar nanofluids is investigated over a vertical plate. Five types of oxide nanoparticles namely copper oxide, titanium oxide, alumina oxide, iron oxide and graphene oxide are suspended in three different types of fluids such as water, kerosene and engine oil. Exact solutions of the governing problem are obtained by the Laplace transform method. Solutions for conventional or regular nanofluid is also recovered as a special case. Temperature of graphene oxide suspended micropolar nanofluid is higher than other oxide nanoparticles based nanofluids.