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Khan, I., Khan, W.A.

Effect of viscous dissipation on MHD water-Cu and EG-Cu nanofluids flowing through a porous medium: A comparative study of Stokes second problem (2019) *Journal of Thermal Analysis and Calorimetry*, 135 (1), pp. 645-656. Cited 1 time.

Abstract

This paper provides a comparative analysis of two different types of nanofluids for Stokes second problem. Additional effects of MHD, porosity and viscous dissipation are also considered. Two types of Newtonian liquids (water and ethylene glycol) are considered as base fluids with suspended nanosized Cu particles. A homogenous model of Newtonian nanofluids over a flat plate is used to describe this phenomenon with Stokes boundary conditions such that the ambient fluid is static and with uniform temperature. The problem is first written in terms of nonlinear partial differential equations with physical conditions; then after non-dimensional analysis, the Laplace transform method is used for its closed-form solution. Exact expressions are determined for the dimensionless temperature, velocity field, Nusselt number and skin friction coefficient and arranged in terms of exponential and complementary error functions satisfying the governing equations and boundary conditions. They are also reduced to the known solutions of Stokes second problem for Cu-water nanofluids. Results are computed using Maple software. The results showed that both skin friction and rate of heat transfer increase with increasing solid volume fraction of nanoparticles. MHD and porosity had an opposite effect on velocity for both types of nanofluids. The dimensionless temperature increases by increasing the Eckert and Hartmann numbers. © 2018, Akadémiai Kiadó, Budapest, Hungary.

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