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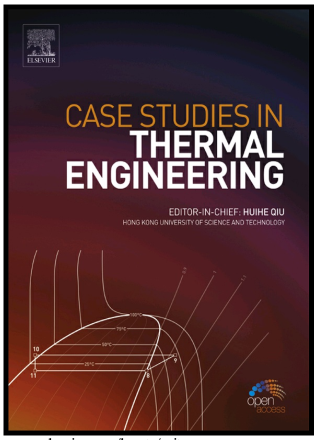

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CASE STUDY OF MHD BLOOD FLOW IN A POROUS MEDIUM WITH CNTS AND THERMAL ANALYSIS

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Abstract

This articles deals with unsteady MHD free convection flow of blood with carbon nanotubes. The flow is over an oscillating vertical plate embedded in a porous medium. Both single-wall carbon nanotubes (SWCNTs) and multiple-wall carbon nanotubes (MWCNTs) are used with human blood as base fluid. The problem is modelled and then solved for exact solution using the Laplace transform technique. Expressions for velocity and temperature are determined and expressed in terms of complementary error functions. Results are plotted and discussed for embedded parameters. It is observed that velocity decreases with increasing CNTs volume fraction and an increase in CNTs volume fraction increases the blood temperature, which leads to an increase in the heat transfer rates. A validation of the present work is shown by comparing the current results with existing literature.

Key words: Blood flow; Nanofluids; SWCNTs and MWCNTs; Thermal fluid; Exact solution

1. Introduction

The nanofluid model was first proposed by Choi [1], as a new class of heat transfer fluids that can be engineered by hanging metallic nanoparticles in conventional heat transfer fluids. The subsequent fluid recognized as nanofluid is probable to exhibit high thermal conductivities compared to those of currently used heat transfer fluids. The nanoparticles used in nanofluids are made of metals alumina, cupper, carbides, metal oxides, nitrides or non-metals (graphite, carbon nano-tubes) and usually water or ethylene glycol are used as base fluids [2-6]. CNTs as nanoparticles have held an essential role in the area of nanotechnology because of their unique electronic structural and mechanical characteristics. CNTs have extraordinary conductivity which helps them to form a network of conductive tubes. CNTs have also been consumed for thermal defense as thermal boundary materials. CNTs with high diffusion conductivity have attracted significantly important attention from researchers [7-9]. CNTs used in nanofluids are usually of two types, specifically single walls carbon nanotubes (SWCNTs) and multiple walls carbon nanotubes (MWCNTs). The width of CNTs ranges from 1 to 100 nm and lengths in micrometer. They have two hundred times power and five times resistance of steel, fifteen times thermal conductivity and 1000 times capability of copper [10-12]. Ding et al. [13] investigated the heat transfer behavior of CNT nanofluids flowing through a horizontal tube. They found important improvement of the