Magnetohydrodynamic flow of casson nanofluid in a channel filled with thermophoretic diffusion effect and multiple slips

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ABSTRACT

This article studied the impacts of thermophoretic diffusion and chemical reaction on MHD (magnetohydrodynamic) CNTs-Sodium alginate nanofluid in a channel filled with porous medium. Two types of nanotubes i.e. single walls carbon nanotubes (SWCNTs) and multiple walls carbon nanotubes (MWCNTs) are suspended in SA-base fluid. The focus of this work is to examine Multiple slips (hydrodynamic, thermal and mass slip) effects on the flow of a casson nanofluid in a vertical channel. The problem is transformed to nondimensional form and then tackled by perturbation method. Effect of diameter and length of CNTs on nanofluids' thermal conductivity is evaluated numerically using modified Yu-Choi model. The results are plotted via MathCAD software. Fluid velocity decreases by increasing the volume fraction of CNTs. Thermal conductivity of CNTs with diameter 500 pm is greater than those whose diameter is 50 mm. The CNTs with length 50 pm has the highest thermal conductivity while lowest for CNT with 0.1 m length.

KEYWORDS

Casson fluid; Heat and mass transfer; Multiple slips; Nanofluid; Perturbation technique

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