عنوان مقاله:

Pulsating Flow and Heat Transfer of Hybrid Nanofluids in a Porous Channel with Temperature-Dependent Heat Generation

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خلاصه مقاله:

Experimental evidences show that hybrid nanofluids made up of two or several types of nanoparticles dispersed in a base fluid are more effective than conventional nanofluids to enhance heat transfer. However, most of the previous studies on the simulation of hybrid nanofluids are based on a simple generalization of the correlations proposed for the conventional nanofluids to the hybrid ones, ignoring the mutual interaction of the hybrid nanoparticles. In this work, recently published experimental data for transport properties of a hybrid nanofluid are used to simulate forced convection heat transfer of alumina-MWCNT-water hybrid nanofluid in a porous channel with temperature-dependent heat generation. The aim of this study is to explore the effect of pertinent parameters on the heat transfer performance. To this aim, the Dacry-Brinkman model for the porous medium and the single-phase model for the nanofluid are adopted to arrive at a stream function-vorticity formulation. The adopted formulation is validated firstly. Then, a grid study and a time-step study are undertaken to find appropriate sizes for the required grid and time-step. Scrutiny of the simulation results indicates that the presence of the hybrid nanoparticles elevates the heat transfer rate, as compared with the base fluid. Meanwhile, it is found that increase in the medium porosity, the Darcy number, or the Reynolds number intensifies the Nusselt number. However, rise in the heat generation parameter deteriorates it. Comparison of the results of the sinusoidal, step, and zigzag pulsation profiles shows that the highest heat transfer .rates belong to the step profile

کلمات کلیدی:

forced convection, pulsating flow, hybrid nanofluid, porous media