

عنوان مقاله:

An Analytical Approach to the Effect of Viscous Dissipation on Shear-driven Flow between two Parallel Plates with Constant Heat Flux Boundary Conditions

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خلاصه مقاله:

An investigation has been made to analyze the effects of viscous dissipation on the heat transfer characteristics for both hydro-dynamically and thermally fully developed laminar shear-driven flow between two infinitely long parallel plates, where the upper plate is moving in an axial direction at a constant speed. On the basis of some routine assumptions made in the literature, a closed-form analytical expression of Nusselt numbers for the flow of Newtonian fluid with constant properties has been developed for three different cases of constant heat flux boundary conditions. The significant effect of the viscous dissipation as compared to other terms in the energy equation is manifested by the Brinkman number. In order to have a generalized idea about the viscous-heating effect on the heat transfer analysis, different definitions of the Brinkman number have been used in the present study. Here, focus is on the viscous dissipative effect due to the shear produced by the moving upper plate apart from the viscous heating due to internal fluid friction for the flow of a Newtonian fluid. The prominent role of the viscous dissipation on the heat transfer characteristics has been discussed in detail for the problem under consideration subjected to different thermal boundary conditions

کلمات کلیدی:

Shear-Driven Flow, Viscous Heating, Constant Heat Flux, Nusselt Number, Brinkman Number

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