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Forced convection heat transfer of nanofluids in a channel filled with porous media under local thermal non-equilibrium condition with three new models for absorbed heat flux

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Abstract

The present work considers forced convection heat transfer of nanofluids in a channel filled with porous media under the Local Thermal Non-Equilibrium (LTNE) condition and includes a three-equation energy model, for the fluid/particle/solid phases. The fully-developed flow and the steady Darcy-Brinkman equation is employed in the porous medium channel. The local thermal non-equilibrium model is assumed between the fluid, particles and the solid phases. The nanoparticles are considered with a non-uniform distribution inside the channel. As a result, the volume fraction distribution equation is also coupled with the other governing equations. The effects of the Nield number and the modified thermal capacity ratio on the heat transfer are completely studied. In our previous work, we introduced one model for calculating the absorbed heat flux by solid, particle and fluid phases. In this paper, three new different heat flux models are proposed and compared together. The effect of Nield number on absorbed heat flux obtained by 4 models are completely studied and compared together. © 2017 by American Scientific Publishers. All rights reserved.

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