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Ghalambaz, M., Doostani, A., Izadpanahi, E., Chamkha, A.J.

Phase-change heat transfer in a cavity heated from below: The effect of utilizing single or hybrid nanoparticles as additives
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Abstract
The present study deals with the effects of hybrid nanoparticles on the melting process of a nano-enhanced phase-change material (NEPCM) inside an enclosure. The bottom side of the cavity is isothermal at a hot temperature while the top wall is isothermal at a cold temperature and the left and right walls are insulated. The governing partial differential equations are first non-dimensional form and then solved using the Galerkin finite element method. Some of the dimensionless parameters are kept constant such as the Prandtl number, the Rayleigh number, the Stefan number and the ratio between the thermal diffusivity of the solid and liquid phases while the volume fraction of nanoparticles, the conductivity and viscosity parameters, and the Fourier number are altered. It is found out that increasing the values of the nanoparticles volume fraction, viscosity and conductivity parameters leads to significant variations in the solid-liquid interface for large values of Fourier number. Moreover, increasing the conductivity parameter and decreasing the viscosity parameter at the same time can cause an augmentation in the liquid fraction. © 2017 Taiwan Institute of Chemical Engineers

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