

Documents

Hajighafoori Boukani, N., Dadvand, A., Chamkha, A.J.

Melting of a Nano-enhanced Phase Change Material (NePCM) in partially-filled horizontal elliptical capsules with different aspect ratios
(2018) *International Journal of Mechanical Sciences*, 149, pp. 164-177. Cited 4 times.

Abstract

Melting of a Nano-enhanced Phase Change Material (NePCM), i.e., n-octadecane paraffin dispersed with Cu nanoparticles, in partially-filled horizontal elliptical capsules for a Rayleigh number of 1.744×10^6 is investigated numerically using the collocated finite volume method. To accommodate the increase in the NePCM volume during melting, a 15% air void within the capsule is considered. The simulations are carried out using the enthalpy-porosity technique and the Volume of Fluid (VOF) model. In this work, three volumetric concentrations ($\Phi = 0, 1$ and 3 vol%) of nanoparticles and various aspect ratios ($AR = 2.0, 1.0$ and 0.5) of the capsule are adopted. The accuracy of the numerical procedure is validated through the comparison of two test cases with those available in the literature. The results are demonstrated in terms of the isotherms, streamlines, melting interface and the air-NePCM interface. It is concluded that for a given AR, the presence of nanoparticles enhances the melting rate and decreases the volume change of NePCM as compared to the pure PCM case. In addition, the highest and the lowest melting rates are associated with the $AR = 2.0$ and $AR = 1.0$, respectively. © 2018 Elsevier Ltd

2-s2.0-85054419506

Document Type: Article

Publication Stage: Final

Source: Scopus