

Numerical Analysis of the Melting of Nano-Enhanced Phase Change Material in a Rectangular Latent Heat Storage Unit

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Abstract : Melting of Paraffin Wax (P116) dispersed with Al_2O_3 nanoparticles in a rectangular latent heat storage unit (LHSU) is numerically investigated. The storage unit consists of a number of vertical and identical plates of nano-enhanced phase change material (NEPCM) separated by rectangular channels in which heat transfer fluid flows (HTF: Water). A two dimensional mathematical model is considered to investigate numerically the heat and flow characteristics of the LHSU. The melting problem was formulated using the enthalpy porosity method. The finite volume approach was used for solving equations. The effects of nanoparticles' volumetric fraction and the Reynolds number on the thermal performance of the storage unit were investigated.

Keywords : nano-enhanced phase change material (NEPCM), phase change material (PCM), nanoparticles, latent heat storage unit (LHSU), melting.

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