Using Phase Change Materials for Thermal Comfort and Energy Savings in Buildings

Malekipirbazari M.*[1] Vaez M. [1] Sharifi H. [2] Sadrameli S.M. [1*]
[1*] Tarbiat Modares University, Faculty of Chemical Engineering, Tehran, Iran
[2] Amirkabir University of Technology, Faculty of Chemical Engineering, Tehran, Iran
sadramel@modares.ac.ir

ABSTRACT

During the last two decades, a lot of efforts have been made in order to reduce the energy consumption and utilize the clean energy. One of the effective systems for heating and cooling storage is using Phase Change Materials (PCMs) installed in the building to shift the peak load. Phase Change Materials are one group of the latent heat materials having low temperature range and high energy density of melting–solidification compared to the sensible heat storage. In this paper, a model is developed to analyze the thermal performance of a room applying a system with phase change material plates in a three layer wall (insulation layer, brick and PCM plate). Using a numerical simulation, indoor air temperature variation of the room for four days has been illustrated, which is verified by experimental data. The indoor air temperature line simulated by the present model and the measured data are found to be in good agreement. The effects of thermal conductivity and thickness of PCM on the thermal performance of the room have also been investigated. The results show that this system has a promising prospective for heating and cooling applications.

Keywords: Latent heat thermal energy storage, Heating & cooling of building, Phase change material, Numerical analyses