Extended Abstract

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Thermal investigation of phase change materials based on LLDPE, paraffin wax and expanded graphite

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Abstract:

Paraffin waxes which are saturated hydrocarbon mixtures, generally entailing of a mixture of different alkanes are frequently used as phase change materials (PCMs) due to their numerous advantages such as high latent heat of fusion, negligible super-cooling, low vapour pressure in the melt and chemical inertness. Paraffin waxes, blended with appropriate polymers to avoid the leaching of paraffin during heating, seem to be the best way for preparation of smart PCMs for different applications such as thermal storage of solar energy, thermal protection of electronic devices, thermal protection of food and medical goods, passive storage in bioclimatic buildings and thermal comfort in vehicles.

Due to the relatively low thermal conductivity of LLPDE and also paraffin wax (approximately 0.2 W/m.K) it is necessary to improve the thermal conductivity of the PCMs by adding conductive fillers. Nowadays, expanded graphite (EG) is commonly used to improve mechanical, electrical conductivity, thermal conductivity and other thermophysical properties.

In this contribution thermal properties of the PCMs based on LLDPE, paraffin wax RT42 (melting point around 42 oC) and expanded graphite were characterized by unique devices, namely PCGT and DICO devices, which allow an investigation of thermal properties of large sized samples in comparison with common Differential Scanning Calorimetry (DSC). Storage and release of thermal energy of the PCMs have been performed by means of PCGT device. It was confirmed that all prepared PCMs were able to store and release thermal energy. Also reproducibility of storage and release heat of the PCMs by repeating of heating and cooling process has been demonstrated. The best results in view of time needed for storage and release energy were achieved with PCMs containing 15 wt.% of EG. Thermal conductivity and diffusivity of the PCMs have been measured by DICO device. Increase of the EG content in the PCMs led to the increase of thermal conductivity and also thermal diffusivity for all investigated PCMs.

Biography:

Mustapha KARKRI obtained his PHD in heat transfer in polymer flow from Polytechnic High School of Nantes in 2004. He holds a full Associate Professor with University of Paris-Est Créteil since September 2007, and is affiliated with the Center for Study and Research on Thermal Science, Environment and Systems (CERTES). From 2005-2007, He has been Temporary Lecturer and Research Assistant position with Femto-st Institut and PostDoc with LEMTA Laboratory of Lorraine University. He has also coordinated many committees and developed national and international collaborations.

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