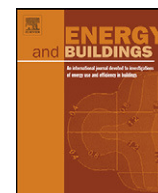




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Review

Review of PCM based cooling technologies for buildings

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ABSTRACT

One of the technologies which help to reduce energy consumption is the thermal energy storage for cooling applications where the cold is stored in phase change materials (PCMs). Such materials would be suitable for use in buildings because they can store a large amount of cold and phase change occurs at a constant temperature, thereby increasing thermal comfort. The aim of the study was to investigate how and where PCMs are used in the cooling systems, how are these systems related to buildings, if they provide lower energy consumption, how the indoor temperatures change due to PCMs and if the indoor air conditions improve. In this article are firstly presented materials that are suitable for such applications and desirable properties for use in such applications. A review of cooling systems follows, which are divided into four groups, namely: free cooling applications, encapsulated PCM systems, air-conditioning (AC) systems and sorption cooling systems, both with integrated PCMs. All studies have shown that the use of PCMs helps to improve energy performance of buildings, the problems were encountered in heat transfer and the amount of PCM needed for storage. These topics are also worthy of further research.

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1. Introduction

In developed countries buildings account for a 20–40% of the total final energy consumption, in the European Union this

number is at 40% [1]. Unfortunately the growing trend of energy use is expected in the future due to climate changes, population growth and increase in the living standard. Therefore one of the priorities of the EU is to minimize the energy consumed by buildings. In order to achieve that a breakdown into energy consumption by end use in the residential sector should be carried out first. Pérez-Lombard et al. [2] report that space conditioning accounts for the biggest share (USA 53%, UK 62%), although at the European level, the weight of HVAC is unknown. This indicates where

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