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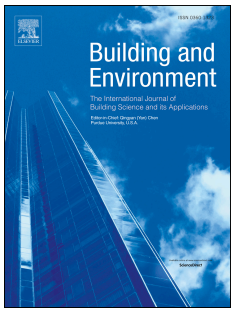

Research on composite-phase change materials (PCMs)-bricks in the west wall of room-scale cubicle: Mid-season and summer day cases

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Research on composite-phase change materials (PCMs)-bricks in the west wall of room-scale cubicle: mid-season and summer day cases

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Abstract

This paper aims to evaluate the effect of applying PCMs into building walls for the improvement of thermal performance in mid-season and summer days. A kind of shape-stabilized PCMs is incorporated into cement mortar to make the PCMs-bricks. Phase change temperature range and latent heat is 15.80-22.28 ^{o}C and 61.44 kJ/kg, respectively. Experimental test of the wall is conducted in room-scale cubicle (3.25m*3.86m*2.91m) in mid-season and summer days for a long time, and comparisons are made with a regular energy-saving wall. Results show that the composite-PCMs wall is in the core phase change temperature range from March 29 to April 30, during which fluctuation and maximum value of the interior wall surface temperature are obviously reduced. However, an insufficiency of liquid to solid phase transition has been observed in the days approaching April 30. Moreover, situations become serious after April 30 since the PCMs do not experience phase change any more. The above parameters become greater for the composite-PCMs wall, so does the interior wall surface heat flow. Maximum values of the interior wall surface temperature and heat flow are both higher for the composite-PCMs wall under either free-floating or air-conditioning cases in summer; an increase of about 43.23% of the heat transferred into the room is observed for a representative sunny day. Discussions about the optimization of the composite-PCMs wall are also conducted.

Keywords: phase change materials (PCMs); composite-PCMs wall; experimental test energy saving; thermal performance

Highlights