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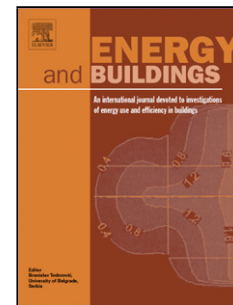
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Energy assessment of a novel dynamic PCMs based solar shading: results from an experimental campaign

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in detail:

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Highlights:

- A new dynamic shutter device (PCM2SHAD) made of a polycarbonate panel integrating PCM is proposed
- Summer results of an experimental campaign in an outdoor test cell are presented
- Different types of PCMs and polycarbonate colours are tested
- PCM2SHAD can reduce the cooling daily energy by about 40% compared to the reference technology
- The window with PCM2SHAD shows a 3 hours time shift of the heat fluxes crossing the system

Abstract

New generations of building envelopes need to responsively manage the exchange between outdoor and indoor environment as well as to regulate the energy storage. The transparent envelope has also to answer to visual requirements allowing to external vision but guarantying comfort conditions. In this framework, a new dynamic solar shading device able to modulate solar heat gains and daylighting, as well as to enhance the thermal inertia of the transparent envelope is presented. The technology named PCM2SHAD system is constituted of a polycarbonate panel containing Phase Change Materials. An experimental analysis was carried out in an outdoor test cell to evaluate the energy performance of the technology. Two configurations of the dynamic shading device were experimentally investigated in Turin (North West Italy), to verify the influence of the colour of the polycarbonate panels and the behaviour of different PCMs typologies (bio, salts hydrates and paraffin based PCM). Results showed a good potentiality of the technology to reduce the cooling daily energy of 40% compared to the reference technology and to improve the thermal inertia of the window shifting up to 3 hours the entering heat fluxes. Furthermore, a reduction of the indoor surface temperature, positively affecting the indoor thermal comfort, was observed.

Keywords:

PCMs, polycarbonate, dynamic shading, translucent building envelope, experimental analysis, energy performance

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