

## عنوان مقاله:

Phase Change Materials (PCMs) as Thermal Storage in Straw Bale Buildings to Conserve Energy

## محل انتشار:

ششمین کنفرانس بین المللی پژوهش در علوم و مهندسی و سومین کنگره بین المللی عمران، معماری و شهرسازی آسیا (سال: 1400)

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## خلاصه مقاله:

In order to improve sustainable conservation and management of energy resources in the construction industry, novel solutions should be considered. One of the most efficient energy optimization solutions can be achieved by using low carbon materials with the potential of energy storage in buildings. Straw bales as bio-based building materials with very low embodied carbon, have the potential of energy saving in most climatic regions; however, due to their low thermal inertia, overheating problems will occur in straw bale buildings during mild and warm seasons. In this paper, different bio-based Phase Change Materials (bio-PCMs) were examined to increase thermal inertia of straw buildings in various climates of Iran, and the energy consumption of the buildings were evaluated and compared. In this way, a conventional residential building was selected, and redesigned with exterior straw bale walls as the case study. Then four bio-PCM mats with  $21^{\circ}\text{C}$ ,  $23^{\circ}\text{C}$ ,  $25^{\circ}\text{C}$  and  $29^{\circ}\text{C}$  phase change temperature ranges were used inside and outside of the exterior envelopes separately, to increase thermal inertia of the straw bale buildings, and their energy performance in four cities representative of climate zones in Iran were simulated. The simulations were carried out using EnergyPlus software. The results showed that heating and cooling energy demand can be reduced up to 13.27% and 22.09% respectively. Applying PCM  $23^{\circ}\text{C}$  outside of the exterior walls of the straw bale building in Mild-Humid climate (Rasht city) showed the best thermal performance

## کلمات کلیدی:

thermal inertia, phase change materials, straw bale, low carbon materials, energy conservation

## لینک ثابت مقاله در پایگاه سیویلیکا:

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