

Numerical and Experimental Assessment of a PCM Integrated Solar Chimney

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Abstract : Natural ventilation systems have increasingly been the subject of research due to rising energetic consumption within the building sector and increased environmental awareness. In the last two decades, the mounting concern of greenhouse gas emissions and the need for an efficient passive ventilation system have driven the development of new alternative passive technologies such as ventilated facades, trombe walls or solar chimneys. The objective of the study is the assessment of PCM panels in an in situ solar chimney for the establishment of a numerical model. The PCM integrated solar chimney shows slight performance improvement in terms of mass flow rate and external temperature and outlet temperature difference. An increase of $11.3659 \text{ m}^3/\text{h}$ can be observed during low wind speed periods. Additionally, the surface temperature across the chimney goes beyond 45°C and allows the activation of PCM panels.

Keywords : energy storage, natural ventilation, phase changing materials, solar chimney, solar energy

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