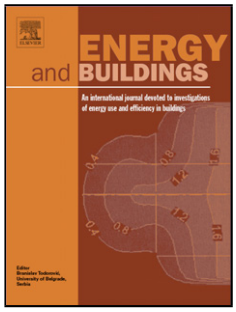

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Scale analysis of heat and moisture transfer through bio-based materials – Application to hemp concrete

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Highlights

- A Heat and Moisture model is developed and validated for a bio-based material
- Scale analysis is applied to the model for different relative humidity ranges
- Temperature changes are a dominant mechanism for moisture transport below $\psi = 95\%$
- For a higher relative humidity liquid transport is the main mechanism for moisture
- And phase change heat transfer is of the same order of magnitude as conduction

Abstract

In the context of energy transition, new construction materials are being developed, with the concern of being more eco-friendly all along their life cycle. This includes bio-based materials like hemp concrete. Based on experimental data, this paper documents a model predicting heat and moisture transfer through hemp concrete. Scale analysis allows to go further into the description by identifying the dominant driving forces both for moisture and heat transfer, for different classes of relative humidity. The case study deals with a material submitted to a variation in temperature and relative humidity on its surface. A significant change is noticed around a relative humidity $\psi = 95\%$. Below this threshold the temperature gradient is the main driving force for moisture transfer. The dominant mechanism becomes