Asociación Argentina
de Mecánica Computacional

Resúmenes de Mecánica Computacional Vol II, pp. 3-3
A. Caggiano, G. Etse, P. Folino, M. Goldschmit, M. Pucheta, M. Storti (Eds.)
P. Folino, P. Mininni (Issue eds.)
Buenos Aires, November 11-14, 2025

RECENT ADVANCEMENTS IN THERMAL ENERGY STORAGES

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Keywords: Thermal Energy Storage, Phase Change Materials, Energy Flexibility.

Abstract. Renewable energy sources suffer from intermittent availability. Adding a latent heat thermal energy storage (TES) is often proposed as an efficient solution to address their stability. This paper explores the computational modeling of transient heat conduction in thermal energy storage (TES) systems for buildings made of cementitious composites with microencapsulated phase change materials (PCMs). Discussion spans both numerical and analytical homogenization models, followed by a comprehensive exploration of approaches to incorporate phase change effects into the numerical solution of transient heat conduction problems. Challenges such as enthalpy-temperature hysteresis and supercooling phenomena are addressed, proposing alternative formulations for stable solutions and improved convergence. The study highlights the complexities of phase change phenomena and emphasizes the need for ongoing research to enhance modeling techniques for practical applications.

Acknowledgements: The author acknowledges the financial support of the Partenariato NEST - Network 4 Energy Sustainable Transition.

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ISSN: 3072-7723 DOI: 10.70567/rmc.v2.ocsid8670