Thermal and economic evaluation of a new thermal insulation materials based on textile waste for building envelope

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Abstract

Sustainability in buildings are currently evaluated not only based upon thermal insulation thickness and heating demand, but also according to primary energy demand, CO2 reductions, and ecological properties of the building materials. Ecological insulation materials have been available on the market for a long time; however, conventional materials are still predominantly used. In this work, the potential applicability of a recycled textile material, based on acrylic and wool waste is investigated. The thermal insulation materials are fabricated by needle punching technique which is based on mechanic consolidation.

The developed insulations are thermo-physically characterized in term of density, air permeability and thermal conductivity. Their properties are inserted into a numerical model, which simulates an external wall exposed to the real climatic conditions of Casablanca, Morocco, in order to study their thermal performance. Finally, an economic model based on Life Cycle Cost analysis (LCC) is adopted to investigate the competitiveness of the developed insulation based on their cost.

An interesting result is obtained in terms of thermal performance and cost and will be presented in the conference.



Figure 1: The four developed insulating Nonwovens

Recent Publications

1. GOUNNI, Ayoub, EL WAZNA, Mohamed, EL ALAMI, Mustapha, et al. Thermal Performance Evaluation of Textile Waste as an Alternative Solution for Heat Transfer Reduction in Buildings. Journal of Solar Energy Engineering, 2018, vol. 140, no 2, p. 021004.
2. WAZNA, Mohamed EL, GOUNNI, Ayoub, BOUARI, Abdeslam EL, et al. Development, characterization and thermal performance of insulating nonwoven fabrics made from textile waste. Journal of Industrial Textiles, 2018, p. 1528083718757526.
3. EL WAZNA, Mohamed, EL FATIHI, Mohamed, EL BOUARI, Abdeslam, et al. Thermo physical characterization of sustainable insulation materials made from textile waste. Journal of Building Engineering, 2017, vol. 12, p. 196-201.
4. GOUNNI, Ayoub et EL ALAMI, Mustapha. The optimal allocation of the PCM within a composite wall for surface temperature and heat flux reduction: An experimental Approach. Applied Thermal Engineering, 2017, vol. 127, p. 1488-1494.
5. GOUNNI, Ayoub, EL ALAMI, Mustapha, MABROUK, Mohamed Tahar, et al. EXPERIMENTAL STUDY OF THERMAL PERFORMANCE OF A REDUCED SCALE CAVITY EQUIPPED WITH PHASE CHANGE MATERIAL (PCM): STUDY OF OPTIMAL PCM LOCATION. Journal of Solar Energy Engineering, 2018.



Biography

Ayoub GOUNNI has a master degree in Renewables Energies and Energetic Systems. He is a PhD student in the field of thermal building. He has worked in energy efficiency of the building envelope by the integration of the Phase Change Materials (PCMs). Furthermore, he worked in the elaboration and thermo-physical characterization of a new thermal insulation materials based on textile waste. He has published over 10 journal and conference papers.

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Notes/Comments: