

Resource deposit, characterization and energy saving potential of olive pomace as a promising aggregate for energy efficient earth bricks in eastern Morocco

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Abstract

The lack of data regarding olive pomace leads to problems of poor management of it. The objective of this research is to propose an innovative management approach within the framework of the circular economy to valorize the abundance of olive pomace in the eastern region of Morocco, particularly in the field of construction. To achieve our objective, a statistical study on the abundance of olive pomace in the Oriental region of Morocco was conducted, followed by the application of several methods to identify the raw material and characterize the composite materials. Initially, soil and olive pomace were identified through tests of particle size distribution, X-ray diffraction, and microstructural characterization using a scanning electron microscope. After identifying the raw materials, the thermo-mechanical properties of earth-based composites reinforced with different mass proportions of olive pomace (0, 10, 20, 30, and 40wt%) were determined. The experimental results highlighted that the physical properties of the raw material, such as the particle size of olive pomace, have an influence on reducing the thermal conductivity by 55.68% and increasing the compressive strength by 81.7% of the composites. The evaluation of the proposed approach was conducted through numerical fluid dynamics simulations to assess the efficiency of a bio-sourced hybrid wall. An improvement of 4.3 h in the time lag was observed by adding 40wt% olive pomace to a wall. By increasing the thickness of this layer to 9 cm, an additional improvement of 9 h was observed. Earth bricks made from olive residue are an environmentally-friendly thermal insulation material, in line with a circular economy approach.

Keywords:

Bio-sourced brick; Thermal inertia; Thermal conductivity; Time lag; Decrement factor; Energy saving.

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