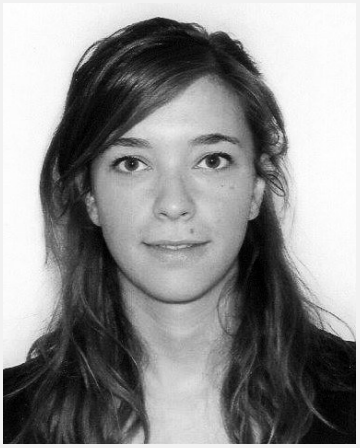
CERIS : Civil Engineering Research and Innovation for Sustainability

Development of insulation and indoor boards with bio-based waste materials and natural glues or biocementation



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Summary

The doctoral project "Development of insulation boards with bio-based waste materials and natural glue" investigates the feasibility of producing boards with thermal insulation properties by using agro-industrial wastes as aggregates. Considering the high environmental impact of the construction sector, responsible for about 40% of the global energy use, research is increasingly dedicated to the study of sustainable solutions for building practices. Among them, the possibility of producing environmentally friendly construction materials with low environmental impact by using bio-wastes. This is a sustainable solution that also helps safe waste disposal and moderates this problem. Several past studies have already investigated this possibility, demonstrating not only the feasibility of producing bio-wastes-based construction materials, but also that they can guarantee good mechanical and hygrothermal properties.

Taking into account these considerations, the doctoral project aims at proposing an innovative eco-efficient construction solution, by using agro-industrial wastes, to improve the thermal insulation of buildings. The considered bio-wastes are widely produced and consumed locally (Euro-Mediterranean countries) to have a large availability and a lower environmental impact: grapes and olives press wastes, hazelnut shells and spent coffee grounds. Wood chips are considered as reference to evaluate aggregates' properties. As for the glues and binders, different materials are investigated: gypsum, lime, citric acid, sodium silicate, and starch-based glue. Hazelnut shells and the sodium silicate solution are selected to be further investigated as components of internal thermal insulation boards or coating panels with insulation performance.

Keywords

Agro-industrial waste, bio-waste, hazelnut shell, hygroscopicity, thermal properties, sodium silicate.