

Thermal and mechanical properties of fired clay bricks made by using grapevine shoots as pore forming agent. Influence of particle size and percentage of replacement

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For decades, the construction industry has focused on developing new materials to minimise environmental impact and improve building insulation envelopes. The use of certain wastes as additives for construction materials (e.g. concrete, clay, steel) has been shown to be a feasible alternative that may improve both the current waste management strategy and the properties of construction materials. Among others, the fired clay brick (FCB) industry has been highlighted as an optimal sector for incorporating such residues, due to the large amount of mass flow involved, the use of firing temperatures above 900 °C and the observed positive effects of FCB thermal conductivity (TC) when organic residues are added. Although the properties of fired clay are closely related to the firing curves and the mineral and chemical composition of raw materials, the effect of particle size is also a key factor that directly impacts on the economic and technical feasibility. This paper therefore assesses the addition of wood chips from pruned grapevine shoots as an additive for manufacturing FCBs, and considers three particle sizes (up to 0.5 mm, above 1.5 mm and between 0.5 and 1.5 mm) and variations in the added percentage on a dry basis. Several samples were tested in order to determine the mechanical and thermal behaviour of FCBs, and it was concluded that the maximum of 10% wood chip content is limited by both the compressive strength values and the water absorption. At this percentage, TC is reduced by up to 50%. The particle size seems to have no effect on the thermal properties, but gives rise to significant variations in terms of the mechanical response. © 2019

Agro-waste

Compression strength

Fired clay brick

Grapevine shoot

Thermal insulation

Valorisation

Brick

Compressive strength

Concrete additives

Construction industry

Environmental impact

Particle size

Thermal insulation

Waste management

Water absorption

Wood products

Agro-wastes

Compression strength

Fired clay bricks

Grapevine shoot

Valorisation

Thermal conductivity