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Identification and enhancement of the thermal and mechanical properties of two types of plasters successively derived from gypsum: from the Safi basin and the High Atlas of Marrakech, Morocco

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Over the past few decades, the construction industry has focused on sustainable, environmentally friendly and easily recyclable materials. The objective of this work is to characterize and enhance the thermal conductivity, mechanical strength and setting time of a composite material based on plaster and lime. This material is designed for use in plasters.

Two types of gypsum are studied, the first one belongs to the Safi basin, the second one characterizes the High Atlas of Marrakech and precisely Douar Tafza. Geologically speaking, the two sites have many similarities. They are characterized by a Meso-Cenozoic age coverage covering a deformed Paleozoic age basement.

The characterization of the plaster's raw material, gypsum, was necessary to determine its physical and geotechnical properties, mineralogy, thermal behaviour and microscopic structure. Several analyses have been developed such as: pycnometer density measurement, X-ray diffraction, infrared spectroscopy and scanning electron microscopy.

We made samples, of standardized dimensions, of two mixtures based on the two types of plaster reinforced by the addition of two types of lime from different localities. The latter are from Marrakech and the Agadir region. The water/plaster mass ratio was set at 0.75 and the addition of lime was achieved by increasing its percentage in slices by 12.5% and up to 50%.

The reinforcement of plaster with lime has enhanced its thermal and mechanical properties and setting time. The measurements show that the addition of lime has reduced the thermal conductivity and increased the mechanical strength of both types of plaster. In addition, following the addition of lime, the setting time has decreased and the basicity of the material has increased. Noting that the intrinsic properties of the raw material influence the mechanical and thermal properties of the material.

Keywords: plaster, enhancement, properties, mechanical, thermal, Morocco

