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Natural cement in Portuguese heritage buildings

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The use of natural cement in Portugal can be chronologically traced between the end of the XIX and the beginning of the XX century in a transitional period between the use of lime-based binders and the general use of the modern Portland cement. The use of these materials is frequently overlapped showing the importance of a correct identification of the existing binder before a conservation or rehabilitation intervention.
Natural cement, also known as Roman cement, results from the calcination bellow the sintering point of natural limestone containing significant amounts of clay. Starting from a process similar to the production of natural hydraulic lime, the higher hydraulicity of natural cement is mainly obtained due to the higher temperatures of calcination resulting in larger quantities of anhydrous reactive phases. The development of this material stemmed from the need of faster setting binders, the use of mortars in high moisture environments, requirements of higher mechanical strength compared to the lime mortars or the need of impermeabilization.
Observations on materials obtained from recent interventions in Portuguese heritage buildings built in late XIX century and early XX century showed the use of a different binder from the traditional air lime and hydraulic lime and from the modern Portland cement. It is believed that this binder is a natural cement.
For a correct conservation intervention with diminished risk, the knowledge about the materials used in ancient times is of the outmost importance in order to avoid damage and promote compatibility between the new materials and the historic fabric. This project aims to fill the knowledge gap about the use of natural cement in Portugal, making use of advanced characterization techniques of the materials and the consultation of the information from the construction of buildings in the considered time period. This will result in new binders being developed and an enhanced knowledge of the construction of this type of buildings.
This work presents fundamentals of the project CemRestore aiming to characterize and identify the use of natural cement in Portuguese construction and the development of modern binders compatible with the existing materials in heritage buildings. The initial findings resulting from the analysis of mortars extracted from heritage buildings of that period under conservation or rehabilitation interventions are presented. Different characterization technics are discussed highlighting their potentiality and limitations.

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