



## **The EU project ROCARE: 19th century Roman cements - historic binders with properties of interest for purposes of restoration and healthy construction**

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The EU-FP7 project ROCARE is seeking to create the conditions needed for the industrial production, marketing and application of an almost forgotten member of the hydraulic binders family: Roman cements were key materials for technical constructions and building façades in the 19th and early 20th centuries, before they fell out of use around World War I. Earlier studies within the EU-FP5 project ROCEM have shown that these binders possess some surprising properties such as e.g. considerable strength at high water-accessible porosity.

The key points of Roman cements are the use of natural marlstones as raw materials in most cases, the low calcination temperatures well below sintering, and the absence of free lime. The product has little in common with modern Portland cements, since its path of hydration is characterised by quick setting and prolonged strength development of the pastes and mortars. The matrix thus formed is composed of coarse CSH phases forming a strong though porous structure which accounts for the extraordinary durability of the mortars and their compatibility with many historic building materials.

To successfully promote and encourage the use of Roman cements nowadays is a complex task which needs to overcome certain barriers existing in the fields of architectural preservation and modern construction. The main tools are the in-depth understanding of the chemical and mineralogical processes involved in the production of the cement and its hydration, a systematic study of mortar formulations and conditions of curing, the scientific assessment of the properties of pastes and mortars vs. the market leading binder systems, a critical approach to the practice of current restoration of facades, etc. All that is based on the possibility to transfer the manufacture of the cements from a proven pilot production process to an industrial level. ROCARE seeks to cover the above aspects by cross-linking all relevant activities of its 14 partners, and including an active network of advisors from many European countries.

The present contribution addresses the most important technical and scientific issues related to the properties of Roman cement mortars and their implication for a wide field of potential applications. In order to illustrate the latter, examples are given for its use in historic and modern times. Key information on the current process of cement production is provided, data on its composition and the phase transformations upon hydration is provided, and appropriate focus is placed on the microstructure of the binders as a key to understand the outstanding performance of the cements and mortars. Finally, an overview of the future activities of the ROCARE project is given.