



Investigation of carbonate rocks appropriate for the production of natural hydraulic lime binders

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Cement industry is facing growing challenges in conserving materials and conforming to the demanding environmental standards. Therefore, there is great interest in the development, investigation and use of binders alternatives to Portland cement. Natural hydraulic lime (NHL) binders have become nowadays materials with high added value, due to their advantages in various construction applications. Some of them include compatibility, suitability, workability and the versatility in applications. NHL binders are made from limestones which contain sufficient argillaceous or siliceous components fired at relatively low temperatures, with reduction to powder by slaking with or without grinding. This study is focused in developing technology for small-scale production of cementitious binders, combining the knowledge and experience of geologists and mineral resources engineers. The first step of investigation includes field techniques to the study the lithology, texture and sedimentary structure of Neogene carbonate sediments, from various basins of Crete Island, Greece and the construction of 3D geological models, in order to determine the deposits of each different geological formation. Sampling of appropriate quantity of raw materials is crucial for the investigation. Petrographic studies on the basis of the study of grain type, grain size, types of porosity and depositional texture, are necessary to classify effectively industrial mineral raw materials for this kind of application. Laboratory tests should also include the study of mineralogical and chemical composition of the bulk raw materials, as well as the content of insoluble limestone impurities, thus determining the amount of active clay and silica components required to produce binders of different degree of hydraulicity. Firing of the samples in various temperatures and time conditions, followed by X-ray diffraction analysis and slaking rate tests of the produced binders, is essential to insure the beneficiation of their behavior. Beneficiation is defined as the implementation of the best available techniques to insure the production of an economically usable final product which combines both the hydraulicity of the silicates, aluminates and ferrites, as well as the reactivity of the calcium oxide amounts that are present.