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Micro- and nanoparticles based on alkali-earth metal hydroxides for cultural heritage conservation

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Wall renders are subject of constant aging and deterioration and they therefore need repair and treatment. The polymers used in the past for consolidation show many drawbacks and often accelerate the deterioration. This implies the need of new non-toxic materials, preferably of the same composition as the original art work, compatible, with long-term efficiency, without side effect, easy for application. Different inorganic materials have been proposed. The lime-based materials are convenient but not efficient enough, so that different approaches to enhance their efficiency must be found. Nanomaterials exhibit distinct properties when compared to their bulk analogues and have been seen as a good alternative of compatible materials for long term preservation [1].

In this context our research intends to study and optimize successful preparative strategies of micro- and nanolimes, and to improve their efficiency in the inhibition of the degradation process and in the consolidation of wall renders and stone [2,3]. The work is focused on the innovation of the tradition lime materials towards long-term efficiency and compatibility with the surfaces of original works, taking into account environmental and human risk factors.

In this communication we report the synthesis and characterization of micro- and nanoparticles based on alkali-earth metal hydroxides for cultural heritage conservation. We discuss synthetic strategies applied and optimum preparative conditions, such as temperature, synthesis duration, addition of surfactant and others, in order to obtain well defined functional magnesium and calcium hydroxides nanoparticles. The composition, morphology and crystallinity are analysed mainly by microscopical techniques and by X-ray powder diffraction. Additional structural and chemical data are collected with other common techniques: Energy Dispersive X-Ray Spectrometry, micro-FTIR, micro-Raman, simultaneous thermal analysis (TGA/DTA) among others, when needed. We also discuss the laboratory tests conducted to assess the efficiency of the nanolimes on mortar specimens (porosity, dynamic elastic modulus, compressive and flexural mechanical behaviour) and the feasibility of their application.

References:

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