

Nanoconsolidants for lime mortars of wall paintings as a good alternative of traditional consolidants

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Carbonate stones and wall paintings, as an irremovable part of the architectural heritage, are subject to constant attack by soluble salts and pollutants. They can undergo different kinds of degradation, including corrosion by acid rain, physical erosion, cycles of salts crystallization/solubilization and biodegradation due to bacteria, fungi or lichens. Often, past treatments tend to cause additional substrate damages. For instances, synthetic polymeric materials applied for work of art restoration as consolidants, protectives, adhesives or cleaning agents, initially were seen as a good treatment alternative. However, upon ageing they are subject to degradation which results in cross-linking or chain scission which consequently alter their own initial properties and accelerate the decay of the artwork by changing its physicochemical properties.

Nanoconsolidants exhibit distinct properties when compared to their bulk analogues, and for the last decade have been seen as a good alternative of compatible materials for long term preservation of Cultural Heritage.^[1,2] A highly efficient consolidant for stone or mortar must meet a large list of requisites: must be effective for long-term, be compatible with the damaged substrate, to induce mechanical improvement and protection from weathering to the material, among others.

The application of micro- and nanoparticles (NPs) based on alkali-earth metal hydroxides for cultural heritage conservation has become more relevant, mainly for consolidation of historic lime mortars, biocalcarene stone and for cellulose materials deacidification purposes.

Our research intends to propose successful preparative strategies of sub-micro and nanolimes, and to study their efficiency in the inhibition of the degradation process and in the consolidation of wall renders. In this communication an overview of the main synthesis strategies to prepare nanoconsolidants for restoration of Cultural Heritage is carried out. We also report our attempts to develop nanoconsolidants based on alkali-earth metal hydroxides for lime mortars of wall paintings. Furthermore, we discuss their effectiveness for the improvement of the mechanical properties of lime mortars.

[1] Baglioni, P.; Carretti, E.; Chelazzi, D., *Nature Nanotechnology* **2015**, *10*, 287.

[2] Girginova, P. I.; Galacho, C.; Veiga, R.; Santos Silva, A.; Candeias, A., *ChemSusChem* **2018**, *11*, 4168.