SUSTAINABLE SILICA SOL-GEL BASED CLEANING SYSTEMS FOR GRAFFITI REMOVAL

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ABSTRACT

Graffiti – as an act of vandalism – represents a real economic, cultural and social plague for community and administrations of urban areas. Despite the many efforts to contrast this phenomenon, no definitive, practical and cost-effective approach has been developed yet.

Herein we propose a sustainable methodology to prepare and screen libraries of new low-environmental impact products, suitable for removing graffiti and murals from stone materials belonging to Venice and its Lagoon UNESCO site. A first series of two-component systems has been accomplished by exploiting silicon and organic carbonate chemistry. Inorganic silica gels have been conceived as the solid matrixes, which were synthesised in acidic non-aqueous conditions by means of the well-known sol-gel chemistry. Dimethyl carbonate (DMC) has been selected as the green organic solvent to load into the gel. DMC belongs to the family of dialkyl carbonates (DACs), whose low toxicity and peculiar features render them valid alternatives to chlorine-based solvents.

Three new cleaning agents has been investigated on mock stained sample of Istrian stones provided by Fondazione Marghera by comparisons with a variety of silica gel systems loaded with polar protic, polar aprotic and non-polar aprotic solvents.

This preliminary evaluation of silica gel/DMC systems by visual inspection and FT-IR spectroscopy has provided promising results for their application as cleaning agents and paved the way to further improvements.

Key-words: Restoration, Silica sol-gel systems, Dialkyl carbonate, Graffiti removal, Green chemistry.