

# Smart materials for the corrosion inhibition of metal artefacts.

Chiara Giuliani, Istituto per lo Studio dei Materiali Nanostrutturati - CNR, Via Salaria km 29,300 - 00015 Monterotondo, Rome, Italy

Corrosion is a natural process that leads to the gradual loss of the structural, functional and aesthetic properties of metal objects due to chemical reactions with the surrounding environment. In particular, in the field of Cultural Heritage the effects of corrosion becomes invaluable. This motivates the research of effective strategies that arrest or slow down the degradation processes of unique and valuable artifacts and monuments.

At present, the environmental sustainability, the cost-effectiveness and the safety and aesthetic requirements are critical issues in the development of high-performance protective materials.

In this context we propose innovative approaches to achieve a long-lasting and safe preservation of Cultural Heritage.

In particular, within the EU H2020 Nanorestart project “NANOmaterials for the REStoration of works of ART”, we developed smart nanostructured coatings able to provide an “active” protection of modern metal works of art. These innovative systems are based on environmentally friendly polymers and stimuli responsive nanocontainers for a tailored release of the corrosion inhibitors. They are easy to be applied and removed by using not toxic water-based solvents and show superior performance with respect to commercial benchmarks.

A similar strategy is used for the conservation of reinforced concrete monuments within the EU H2020 InnovaConcrete project “Innovative materials and techniques for the conservation of 20th century concrete-based cultural heritage”. Innovative multifunctional impregnation treatments are obtained by incorporating smart nanocarriers, functionalized with corrosion inhibitors for steel, into appropriate consolidants. The *stimuli responsive* nano-reservoirs act at steel bars by releasing the inhibitor under stimuli related to corrosion processes, whereas consolidants with high affinity and compatibility for building materials improves their mechanical properties.

A similar approach may be of interest within the framework of the DTC Lazio project SISMI “tecnologie per il miglioramento della Sicurezza e la Ricostruzione dei centri Storici in area SisMica”.