The conservation of modern and contemporary works of art requires advanced solutions at the cutting edge of modern chemistry and material science. The NANORESTART project focuses on the synthesis of novel poly-functional nanomaterials and on the development of highly innovative restoration techniques to address the conservation of a wide variety of materials. The ground-breaking nature of our research can be more easily outlined by focusing on specific issues.

The main conservation challenges that will be addressed in the project are:

**Conservation challenge 1**
Cleaning of contemporary painted and plastic surfaces (CC1)

**Conservation challenge 2**
Stabilization of canvases and paintings in contemporary art (CC2)

**Conservation challenge 3**
Removal of unwanted modern materials (CC3)

**Conservation challenge 4**
Enhanced protection of artworks in museums and outdoors (CC4)

The NANORESTART project is articulated into eight workpackages (WPs) that will cover 42 months.

**WP 2 - New tools for cleaning**
Formulation of nanstructured residue-free cleaning fluids, through the use of self-degrading surfactants, new class of gels for the confinement of cleaning systems and new enzyme solutions in highly retentive gels.

**WP 3 - Surface strengthening and consolidation**
Restoration of the original mechanical properties of works of art using nanocellulose and cellulose derivatives in combination with nanoparticles; development of porous silica particles loaded with plasticizers for restoring the mechanical properties of plastic and paint layers.

**WP 4 - Protection of surfaces**
Development of polyfunctional protective systems, which combine "active" and "passive" strategies. "Active" systems are based on green polymeric matrices functionalized with nanomaterials.

**WP 5 - Nanostructured substrates for highly sensitive detection**
Development of nanstructured substrates and sensors for the enhanced detection of degradation products from modern and contemporary art.

**WP 6 - Environmental impact assessment**
Environmental impact assessment of the most effective and promising technologies developed in WPs 2-5.

Several products developed within NANORESTART are currently being tested by conservators and restorers on representative case studies. Among the selected works of art, outstanding masterpieces of contemporary and modern art, such as paintings by Pollock or Picasso, were successfully restored using innovative hydrogels and nanostructured fluids formulated by NANORESTART partners.

**Innovative cleavable surfactants** were synthesized, which represent a new class of spontaneously degradable amphiphiles. About 12 environmentally friendly nanostructured fluids were developed for the removal of unwanted materials from artistic surface.

**The use of cellulose derivatives in combination with nanoparticles could ensure the consolidation of fiber-based materials.** Several formulation for the nanorelining of canvases and for the single-thread consolidation of fibers are currently being developed.

A disposable electrochemical sensor was developed for convenient detection of gaseous formaldehyde that is considered as one of the most important indoor pollutants. It can be used as a marker molecule for material degradation.

Polyfunctional protective systems, both active (releasing corrosion inhibitors) and passive (gas barrier), are being developed for the preservation of metal artifacts and rapid prototyping materials.

Selective removal of unwanted modern materials, such as adhesives or overpaints due to vandal actions, was performed using hydrogels loaded with nanstructured fluids and organogels.

CLP and ecotoxicity of developed products were evaluated following EU safety regulations.
AT A GLANCE

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Project reference: 646063

Topic: NMP-21-2014 - Materials-based solutions for protection or preservation of European cultural heritage

Call for Proposal: H2020-NMP-2014-two-stage

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Duration: 42 months

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Consortium: 27 partners from 12 countries

Project Coordinator: CSGI - Consorzio Interuniversitario per lo Sviluppo dei Sistemi a Grande Interfase (Firenze, IT)

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