



DAYS

Chemistry for Cultural Heritage

Thursday, 26 June, D1 room, 9:00 a.m.

- 9.00-9.15 **Investigations on Cultural Heritage: the MEMIP09 Project**
Lorenza OPERTI (10 min of discussion)
- 9.25-9.40 **Progresses in Analytical Techniques for Cultural Heritage (PatchArt Project)**
Angelo AGOSTINO (10 min of discussion)
- 9.50-10.05 **Porcellane**
Francesca TURCO (10 min of discussion)
- 10.15-10.30 **Ancient pottery and building materials: the contribution of archaeometry to archaeological theories**
Patrizia DAVIT (10 min of discussion)
- 10.40-10.50 **Commissione Spokes**
- 10.50-11.10 **Coffee break** (discussion)
- 11.10-11.25 **Studies on ancient and historic metals**
Paola RIZZI (10 min of discussion)
- 11.35-11.50 **Archaeometry and analytical chemistry in art-history and archaeology: research perspectives in the investigation of natural dyes by Surface enhanced Raman spectroscopy**
Monica GULMINI (10 min of discussion)
- 12.00-12.15 **Polymers for Art: the conservation approach**
Oscar CHIANTORE (10 min of discussion)
- 12.25-12.40 **Organic materials in works of art: issues on their identification and aging behavior.**
Dominique SCALARONE (10 min of discussion)
- 13.00 **End of the day**

Investigations on Cultural Heritage: the MEMIP09 Project

Lorenza Operti

Researches on Cultural Heritage commonly require a multidisciplinary approach. This is fundamental to maintain a comprehensive and open attitude towards objects that are not just “samples”: they are a propagation of the man imaginative and ingenious attitude, and therefore, intrinsically precious and multifaceted. Whether they are art pieces, archeological evidences or biological remains, their study requires coordinating and organizing different fields of study referring to exact and human sciences and conservation, each one characterized by a different way of thinking, researching and operating.

This multidisciplinary approach, associated to non-invasive and in situ analyses, was the backbone of the MEMIP09 Project - Medieval Enamels, Metalworks and Ivories in Piedmont, at Chemistry Department of Turin University. Main topics and research fields will be presented to briefly illustrate the research activity of the MAIN group on Cultural Heritage.



Progresses in Analytical Techniques for Cultural Heritage (PatchArt Project)

Angelo Agostino

Research and technological development specific to the field of Cultural Heritage have a limited diffusion, due to the intrinsic limited market demand; it is very important, therefore, check the possibility of technological transfer from different industrial sectors with significant economic impact, taking into account the specific needs of the works of art. In particular, the major effort have to be focused to the adaption and optimization of non-invasive techniques aiming at preserving the integrity of the artefacts.



This project aims at contributing to technological development in the field of cultural heritage with the integration of non-invasive techniques: X-ray fluorescence (XRF) and fiber optics reflectance spectroscopy (FORS) will be coupled in a single device. The aim of this project will be to develop a hybrid

instrumentation XRF/FORS, already in a prototyping stage, able to allow, thanks to the development of a dedicated software, the determination of information on superimposed paint layers, defining the composition and succession of them.

Starting from well-known techniques widely used in the diagnostics of works of art, the project aims to develop advanced devices in which these techniques can be integrated in order to improve the quality and the quantity of information and therefore reduce the investigation time. The system is not currently available in the market nor in Cultural Heritage sector nor in other areas and therefore this proposal represents an innovation not only limited at this field of interest.

Porcellane

Francesca Turco, Patrizia Davit, Angelo Agostino, Lorenza Operti

Con la recente collaborazione con Palazzo Madama si è aperto un filone di indagine sulla porcellana, manufatti preziosissimi nei secoli passati, dalla storia avventurosa e dallo scarso successo archeometrico. Numerosi pezzi delle manifatture piemontesi del XVIII secolo sono stati esaminati per effettuare una caratterizzazione tecnologica e risolvere alcune assegnazioni dubbie. Il contemporaneo esame della documentazione storica ha evidenziato alcune incongruenze rispetto ai dati emersi dall'analisi composizionale, condotta con XRF portatile. Parallelamente è stato avviato uno studio sull'ottimizzazione degli standard per questo tipo di determinazioni, anche in confronto con altre tecniche analitiche (SEM-EDX).

Ancient pottery and building materials: the contribution of archaeometry to archaeological theories

Patrizia DAVIT, Francesca TURCO, Lorenza OPERTI

From 2009 a collaboration with the Department of Antiquity of the University of Florence concerns the study of the Bronze Age site of Erimi-Laonin tou Porakou (Kouris River Valley), Limassol District, Cyprus. Due to the fact that the site was just discovered at the beginning of the collaboration, the contribution of archaeometric study on the excavated materials was of primarily importance in the archaeological understanding of the history of the site. The two main topics under study were the characterization of Red Polished Ware from survey, with particular reference to the evaluation of the technology of production and the inspection of plasters/mortars coming from different architectural/functional contexts.

More recently other collaborations with the Department of Historical Study of the University of Torino opened up on research projects on materials coming from Nisa Parthica (Turkmenistan), from Locri Epizephiri (Calabria) and from the Roman *Villa* of Costigliole Saluzzo (Piemonte).

Studies on ancient and historic metals

P.Rizzi, M.Baricco, L.Battezzati, A.Castellero (MET)

- 1) Which were the techniques used to produce a metallic artefact?
- 2) Which is the preservation state of the metallic artefacts?
- 3) Were these artefacts produced by the same workshop?

These are some of the questions to which an archaeometallurgist is often asked to answer. In order to give answers, different analytical, structural, microstructural and calorimetric techniques have to be applied. If the information on the production techniques is contained in the microstructure of a metallic object, in the slags is contained the information on the smelting techniques used to produce the raw metallic materials. Therefore, metallography is a useful tool to discover secrets trapped in ancient metallic artefacts.

Several collaborations with the Soprintendenza per i Beni Archeologici del Piemonte and Soprintendenza per i Beni e le Attività Culturali della Regione Autonoma Valle d'Aosta and other public institutions are running. Examples will be reported on studies made on iron artefacts, slags, silver artefacts, bronzes.

Archaeometry and analytical chemistry in art-history and archaeology: research perspectives in the investigation of natural dyes by Surface enhanced Raman spectroscopy

Monica Gulmini

Abstract: The investigation of historical objects and archaeological finds through modern analytical methods needs both an in-depth expertise in the use of diagnostic tools and a thorough knowledge of the materials used in antiquity in term of technology of production and weathering processes. This is why the study of ancient materials inherently links various disciplines within and beyond the chemical field. These aspects will be briefly sketched, then the attention will be focused on the analysis of natural organic dyes, with particular reference to the use of non-invasive and micro-invasive strategies of investigation. Particular attention will be devoted to discuss future developments of surface enhanced Raman scattering in this specific field.

Polymers for Art: the conservation approach

Oscar Chiantore, Tommaso Poli, Dominique Sclarone, Chiara Riedo, Dafne Cimino

Polymer molecules are normally encountered in art objects and historical manufactures not only as structural or functional constituents but very often also as materials used for conservation purposes. In Cultural Heritage consolidants, adhesives, coatings and protectives are almost exclusively of macromolecular nature. The development of synthetic polymers and the increased knowledge into the relationships between molecular and supramolecular structures and the materials properties is shifting the traditional approach of crude application of polymers and resins commercially available and produced for industrial purposes, towards the development of polymer based systems tailored for the specific conservation needs.

The activities of the Polymer Materials Groups in this field will be presented, with reference to ongoing investigations dealing with highly compatible polymer gels to be used for cleaning of painted surfaces and with innovative adhesives for the consolidation of flaking painted surfaces.

Organic materials in works of art: issues on their identification and aging behavior.

Dominique Scalarone, Tommaso Poli, Paola Croveri, Chiara Riedo, Anna Piccirillo, Oscar Chiantore

A variety of organic compounds, ranging from synthetic polymers to biomolecules, pigments and additives, can be found in archeological and art objects either as varnishes and protective coatings or binding media, adhesives, consolidants and finishing layers.

They are mainly used in the manufacturing of paintings, but also in pottery, furniture and wooden objects, sculptures, musical instruments and works on paper. In addition, natural and synthetic resins have widespread diffusion as conservation materials.

All these materials undergo environmental aging, possibly resulting in the loss of aesthetic, chemical and mechanical properties. The identification of the original and degraded components, their molecular and physico-chemical characterization and their distribution in the work of art or on its surface, are necessary for any choice regarding conservation needs and related restoration treatments.

This contribution wants to give an overview of the research activity carried on within the Polymer Materials Group in collaboration with public institutes and museums, also showing some similarities and differences with degradation and stability issues of organic materials and coatings for industrial applications.