ANÀLISI DE MATERIALS DE PATRIMONI CULTURAL

Analysis of Cultural Heritage Materials

Universitat Politècnica de Catalunya · BarcelonaTech

RESEARCH The aim of the group is to study materials of historic, archaeological, artistic and cultural heritage interest using chemical-analysis techniques and scientific equipment.

Apart from determining the composition of the materials, it is possible to explain the chemical mechanisms involved in the processes of ageing and alteration, which is of considerable interest in the field of conservation and restoration, and to obtain information on production technologies, geographic origin, trade, etc. Another area of work involves reproducing antique materials not just to understand the production technology but also to produce reference standard materials. The group also performs laboratory studies to reproduce ageing and reaction processes.

MULTIDISCIPLINARY TEAM

Permanent staff

- NATI SALVADÓ, SALVADOR BUTÍ (Dept. d'Enginyeria Química, EQ)
- TRINITAT PRADELL (Dept. de Física, FIS)

Post-doctoral

- ELENA SALINAS –archaeologist (Dept. FIS)

PhD Student

- MARTÍ BELTRAN –(Associated professor Dept. FIS),
  RUTH SADURNÍ – (Dept. FIS), NÚRIA ORIOLS – *Chemist of MNAC* (Dept. EQ)

Collaborators doctors

- JUDIT MOLERA –geologist (Universitat UVIC)
- CARME CLEMENTE –restorer (Escola d'Art i Disseny a Tortosa)

RESEARCH LINES: techniques and materials, reverse technology, alteration and conservation

Paintings (N. Salvadó and S. Butí) EQ

- Wood paintings: altarpieces
  - 14th-15th Century Paintings: Ageing materials and reaction compounds
  - Baroque period: historical evolution of materials and painting techniques
- Wall paintings
  - techniques and conservation problems
  - *in-situ and transferred Romanesque mural paintings*

Stained Glass (T. Pradell) FIS

- Conservation of Modernist Catalan enamelled stained glass
- Catalan glazes
- Enamels

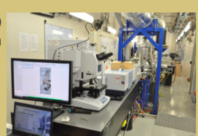
Ceramics, Glazes and decorations (T. Pradell and E. Salinas FIS-UPC, J. Molera -UVic)

- Polychrome decorations and lustre ware
- Islamic Glazed wares in Al Andalus
- Jun ware

ANALYTICAL TECHNIQUES

- - optical microscopy OM
  - scanning electron microscopy/ Focused ion beam (FIB/SEM)
  - X Ray diffraction XRD
  - infrared spectroscopy FTIR
  - Raman spectroscopy
  - infrared spectroscopy FTIR
  - X-ray photoelectron spectroscopy (XPS)
  - Differential scanning calorimetry (DSC)
- **Synchrotron based techniques** (ALBA Synchrotron –Cerdanyola del Vallès, Diamond Light Source – Chilton-Didcot UK, ESRF –Grenoble France)
  - micro-X Ray diffraction μSR-XRD
  - micro-X Ray fluorescence μSR-XRF
  - micro-infrared spectroscopy μSR-FTIR
  - extended X-Ray absorption fine structure, EXAFS spectroscopy

beamline MIRIAM (μSR-FTIR) Diamond Synchrotron



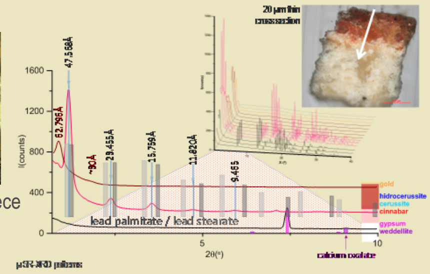
beamline XALOC (μSR-XRD) ALBA Synchrotron

SOME CASES OF PAINTINGS RESEARCH

Ageing and reaction compounds

Lead soaps in tempera paint layers

15th century Gothic altarpiece



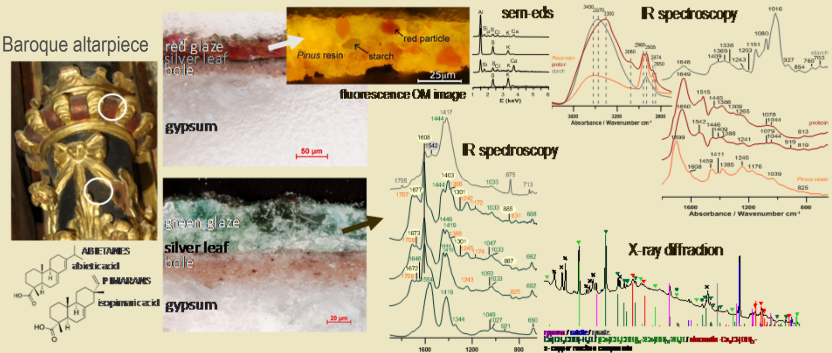
• N. Salvadó, S. Butí, T. Pradell, V. Beltran, G. Cinque, and J. Juanhuix. Chapter 11. In: Casadio F. et al. (eds) Metal Soaps in Art. Cultural Heritage Science. Springer. 2019, 195-210

Coloured translucent glazes over silvering

silver leaf corrosion

18th Baroque altarpiece

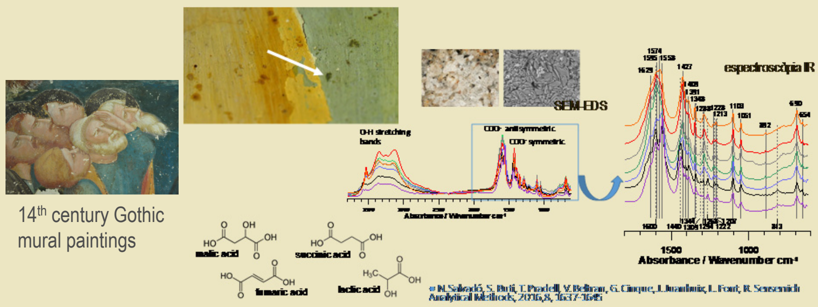
18th Baroque altarpiece



• N.Salvadó, S. Butí, C. Clemente, V. Beltran, G. Cinque, J. Juanhuix, T. Pradell Pure Applied Chemistry, 2018, 90(3),477-492

Conservation problems

Markers of old fungi activity



14th century Gothic mural paintings

• N.Salvadó, S. Butí, T. Pradell, V. Beltran, G. Cinque, J. Juanhuix, L. Font, R. Senserrich Analytical Methods, 2016, 8, 1637-1645

Current research projects:

MINECO (Spain) grant MAT2016-77753-R. Tecnología inversa de vidriados, esmaltes y capas pictóricas para la recuperación del Patrimonio Histórico-Artístico. 2017-2020

Generalitat de Catalunya, grant 2017 SGR 42. Transicions de fase, polimorfisme, vidres i dinàmica de la metastabilitat. 2018-2020

Synchrotron Radiation: proposal SM22920 for beamtime on MIRIAM B22 Beamline at Diamond Light Source/ grant 2019093925 for beamtime on BL13 Xaloc beamline and grant 2019093920 for beamtime on BL01 MIRAS beamline at ALBA Synchrotron

17 December 2019 Barcelona