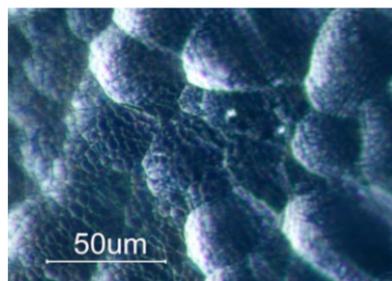


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Microphotograph from a corroded glass surface

The effect of the addition of transition metal ions on potash-glass corrosion

In this work the corrosion processes of potash-glass surfaces in contact with aqueous solutions were studied. Model glass samples were prepared reproducing the compositions of the medieval stained glass from the *Mosteiro de Santa Maria da Vitória*. Cu, Mn and Fe oxides were added, either individually, or in combined form. Corrosion and its progress were studied using ion beam analysis, FTIR spectroscopy, optical microscopy and the changes occurring in the aqueous solution, in particular its pH value.

This study shows that the experimental conditions used reproduce well the corrosion found in ancient glasses of potash composition, weathered through five centuries. It also indicates that pH is a good parameter for following corrosion kinetics in high humidity conditions.

In collaboration with Instituto Tecnológico e Nuclear.

Publications

M. Vilarigues and R.C. da Silva, "Characterization of potash-glass corrosion in aqueous solution by Ion Beam and IR Spectroscopy", *Journal of Non-crystalline Solids*, 352, 5368-5375 (2006).

All the projects and case studies are the result of a collaboration between the Glass and Ceramics Conservation and Restoration Laboratory (responsible Augusta Moniz Lima, arl@fct.unl.pt) and the research unit "Glass and Ceramics for the Arts" (responsible António Pires de Matos, pmatos@itn.pt). Other supervisors are Ana Ramos, Margarida Rolim, Márcia Vilarigues and Rui M. C. Silva from the *Universidade Nova de Lisboa*, Carlo Pantano from the Penn State University and António Monge Soares from the *Instituto Tecnológico e Nuclear*. The work presented had also the collaboration of other national and international institutions namely the University of Antwerp, the *Stazione Sperimentale del Vetro*, the *Museu Nacional de Machado de Castro*, the *Museu do Vidro da Marinha Grande*, the *Instituto Politécnico de Tomar*, the *Mosteiro de Santa Maria da Vitória*, in Batalha and the *Mosteiro de Santa Clara-a-Velha*, in Coimbra.

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GLASS AND CERAMICS CONSERVATION AT UNL



The glass and ceramics field of the Master Course in Conservation and Restoration of the *Universidade Nova de Lisboa* is developed in well equipped laboratories where the students have a constant interaction with academic staff, senior researchers and PhD students. The students have access to state-of-art equipment either in the Department of Conservation and Restoration and the other Departments in the University Campus, or in other external Laboratories namely in the *Instituto Tecnológico e Nuclear*. There is also a close collaboration with the Research Unit *Vidro e Cerâmica para as Artes* located in the same building where all the types of glasses, glazes, enamels and ceramics can be synthesized or processed using the existing furnaces and equipment. Besides the collaboration with several National Museums, there is among others, international collaborations with highly prestigiated institutions namely The Corning Museum of Glass, the Penn State University, the University of Antwerp and the *Stazione Sperimentale del Vetro*. The academic staff and the young researchers organized in 2005 in the *Universidade Nova de Lisboa*, the 1st International Meeting on Glass Science in Art and Conservation and some of them are now integrating the Committees of the 2nd meeting to be held in Valence in March 2008. They were also invited to study the organization in Portugal of the ICOM Glass Meeting.

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Millefiori glass vase, 17th century, Mosteiro de Sta. Clara-a-Velha

Provenance studies of Portuguese glasses

The main aim of this project is to study the provenance of Portuguese glasses from the 15th to the 20th century and evaluate the currently available analytical techniques for the study of glass materials, such as micro-EDXRF, EPMA, ICP-MS, AAS and NAA. New techniques are being developed as well as a new micro sampling process. The investigation focused on the glasses from Coima and Marinha Grande royal glass manufactures between the 18th and 19th century. Chemical characterization of 17th century millefiori and filigrana glasses excavated in the Mosteiro de Sta. Clara-a-Velha in Coimbra was also performed providing interesting information related with the provenance of these glasses. Different types of production were identified, such as Venetian millefiori, façon de Venise filigrana and other utilitarian objects probably locally made.

In collaboration with the Instituto Tecnológico e Nuclear, the Instituto Politécnico de Tomar, the Mosteiro de Santa Clara-a-Velha, the Research Unit Vidro e Cerâmica para as Artes, and the AGLAE Laboratory (EU-ARTECH Program).

Selected communication

Augusta M. Lima, Maria C. Freitas, Filipa M. Lopes and António Pires de Matos, "Analysis of glass - evaluation of non-sampling micro-EDXRF", *TECHNART 2007 (Non-destructive and Microanalytical Techniques in Art and Cultural Heritage Research)*, Lisbon-Portugal, 25-28 April 2007.

Glazes of ancient and contemporary ceramic artworks and their corrosion mechanisms

The aim of this research is to study the corrosion mechanisms of glazes of ancient and contemporary ceramic artworks using model samples artificially weathered in laboratory. Synthesized glazes will be exposed to different environmental conditions of temperature, relative humidity and acidity using climatic chambers in order to study their chemical behavior under various conditions. Aside conventional techniques to study the corrosion in vitreous materials – SEM-EDX, XRF and XRD – in-situ weathering using atomic force microscopy will be used to study the modifications of the surface structure. A contribution to the study of more stable glazes to be used by artists is envisaged.

In collaboration with the Materials Research Institute (Penn State University) and CENIMAT (FCT-UNL).

Stained glass from the Monastery of Batalha: non-destructive characterization of glass and paintings

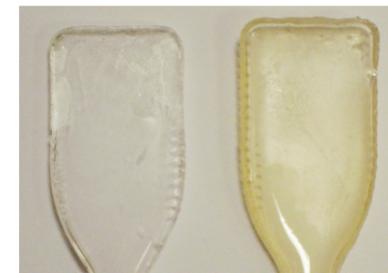
The characterization of stained glass fragments belonging to the *Mosteiro de Santa Maria da Vitória* in Batalha, was performed by non-destructive analyses. The objective of the work was to determine the composition of the glass and respective paintings trying to establish the corresponding production periods. The analysed glasses may be classified into two groups, according to their composition: potash and soda-lime glasses. Each group corresponds to a different production time; potash glasses are the original ones, produced during the 15th and 16th centuries and the soda-lime glasses were introduced during the conservation-restoration works performed in the 20th century.

In collaboration with the Instituto Tecnológico e Nuclear and Instituto de Gestão do Património Arquitectónico e Arqueológico.

Communications

P. Fernandes, M. Vilarigues, L.C. Alves and R.C. da Silva "Stained glass from Monastery of Batalha: non-destructive characterization of glass and paintings", *Glass Science in Art and Conservation, Valencia, Spain, 5-7 March, 2008.*

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Araldite 2020 epoxy resin before and after 300 hours of exposition to intense UV radiation

Studies on degradation of epoxy resins used for conservation of glass

Photo-degradation of three room-temperature-cure epoxy resins – *Hxtal NYL-1*, *Araldite 2020* and *Epo-tek 301-1* – considered the most adequate for conservation of glass and ceramics were studied. Samples of the resins were subjected to accelerated ageing using a SolarBox. Fourier transformed infrared spectroscopy, colorimetry, differential scanning calorimetry, atomic absorption spectroscopy and tensile strength mechanical tests were the techniques used to study degradation phenomena.

In collaboration with REQUIMTE-CQFB (FCT-UNL) and CENIMAT (FCT-UNL).

Communications

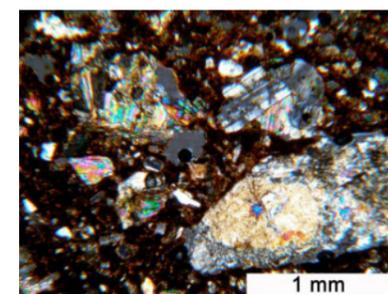
Inês Coutinho, Ana M. Ramos, Augusta M. Lima, "Studies on degradation of epoxy resins used for conservation of glass", *Holding it all together; ancient and modern approaches to joining, repair and consolidation*, The British Museum, London, United Kingdom, 21-22 February, 2008.

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Replica of a 15th century Hispano-moresque tile

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Thin section of a ceramic from Salsa 3 (polarized light)

Textural, mineralogical and chemical characterization of archaeological ceramics from Passo Alto and Salsa settlements (Lower Alentejo, Portugal)

The research of archaeological ceramics contributes, in several cases, to the understanding of the mobility of those materials between communities, the technologies used in pottery production and also to provenance studies of the raw materials. This work involved the characterization of ceramics from Passo Alto (Late Bronze Age and Early Iron Age) and Salsa 3 (Late Bronze Age) using petrographic analysis with optical polarized light microscopy, mineralogical analysis by XRD and chemical analysis using micro-EDXRF. The first results showed that the archaeological ceramics studied were mainly locally made and no indication of mixing of raw materials to improve the ceramics properties was observed.

In collaboration with the Instituto Tecnológico e Nuclear, the Centro Tecnológico da Cerâmica e do Vidro and the Department of Earth Sciences (FCT-UNL).

Communications

Carina Maurício, Augusta Lima, António Monge Soares, João Coroado, Carlos Galhano and Joaquim Simão, "Textural, Mineralogical and Chemical Characterization of Archaeological Ceramics from Passo Alto and Salsa Settlements (Lower Alentejo, Portugal)", *EUROCLAY 2007, Aveiro-Portugal, 22-27 July, 2007.*

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St. Joseph face from the panel Fuga para o Egipto

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Detail of a Chinese porcelain, 17th century Mosteiro de Sta. Clara-a-Velha

Chemical characterization of Chinese porcelains from the Mosteiro de Sta. Clara-a-Velha

This work will focus on the study and characterization of Chinese porcelains belonging to the *Mosteiro de Sta. Clara-a-Velha* in Coimbra. Several non-destructive analytical techniques will be employed, such as micro-EDXRF, PIXE with external ion beam and Raman spectroscopy which will be used to study the compositions and production techniques of the porcelain pastes and glazes. The results obtained will contribute to provenance studies of these very rare and high quality porcelains and to define their production periods.

In collaboration with Mosteiro de Sta. Clara-a-Velha and CENIMAT.