MATERIAIS 2019
MATERIALS FOR A BETTER LIFE ...
14 – 17 APRIL 2019
NOVA UNIVERSITY OF LISBON

Artistic materials for a better life… Using synchrotron-based micro-analysis for the characterization and conservation of cultural heritage

Marine Cotte[1], [2]

1 European Synchrotron Radiation Facility, 71 avenue des martyrs, Grenoble, France
2 Sorbonne Université, CNRS, Laboratoire d'archeologie moleculaire et structurale, LAMS, Paris, France

The chemical analysis of artworks can be done with various techniques. Some studies aim at identifying manufacturing processes (choice of ingredients, purification, firing, etc), which can be used to follow in space and in time the development of craft and artistic practices, as a mirror of the global development of technical knowledge of civilisations. Other studies aim at preserving our cultural heritage, by understanding possible degradation phenomena (through the characterization of degradation products, the identification of internal and external triggers, the development of conservation treatments, etc.). Within the wide range of techniques used for such characterizations, those exploiting the synchrotron-radiation lights have been increasingly used. This particular radiation offers many advantages, among which:
- a bright beam, which permits fast acquisitions, allowing to use standard laboratory techniques such as XRF and XRD in 2D or even 3D modes, with much improved detection limits, which translate into wider corpus, wider fields of view, higher representativeness of the results and higher sensitivity;
- a collimated beam, which permits to focus the beam to the micron range, and even smaller with state-of-the-art nano-probe beamlines. This is particularly important considering the heterogeneity of artistic materials;
- an extended and almost continuous energy range, which gives access to X-ray spectroscopy. This technique is particularly relevant for the analysis of artistic materials since it probes element speciation, which is usually altered during object manufacturing or degradation. Information about chemical reactions involved throughout the entire life of the works of art can thus be obtained. Beside, synchrotron radiation also gives access to lower energies and spectroscopy performed in the UV/visible and the infrared domains can offer complementary characterization tools.

The present talk will focus more particularly on micro X-ray and micro FTIR analyses recently carried out at the ID21 beamline at the ESRF and to applications to the study of artistic materials [1].

References:
[1] Cotte, M., E. Pouyet, et al. (2017) "The ID21 X-ray and infrared microscopy beamline at the ESRF: status and recent applications to artistic materials." Journal of Analytical Atomic Spectrometry 32: 477-493.

Presenting author: Marine Cotte
ESRF, 71 avenue des martyrs
38043 Grenoble
France
Email: cotte@esrf.fr