

MOLAB: an European mobile laboratory enabling advanced studies in Archaeometry

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In the last decades, many efforts have been devoted towards the development of non-invasive and mobile spectroscopic methods based on point analysis and hyper(multi)-spectral imaging. The results on the most recent in situ application of non-invasive methodologies have shown how the integration of data from different spectroscopic techniques can successfully overcome the intrinsic limitation of each single method and provide valuable information in the study of a variety of heritage objects without sampling. At the conference the recent advancements related in the implementation of X-ray based non invasive methods will be presented. In particular, the spectroscopic capabilities and performances of a novel mobile X-ray multi-technique instrument of the European Research Infrastructure of Heritage Science will be presented. The multi-technique device, named LANDIS-X, integrates macro-XRF (MA-XRF), micro-XRF (MXRF) and confocal-XRF (CXRF) non-invasive techniques for performing the 2D and 3D elemental imaging of artworks [1]. A novel X-ray diffraction (XRD) module is under commissioning in the system in order to combined the elemental information from the XRF scanning to a mineral fingerprinting of materials composing the samples. MA-XRF and MXRF analysis can be performed over an area of 110x70 cm² with a scanning speed of 100 mm/sec. XRF imaging is also performed in rotational mode on artworks with complex three-dimensional geometry providing the elemental distribution images over a 360 degrees view. Finally, the use of the CXRF technique allows us the elemental depth-profiling of multi-layered samples providing information on their stratigraphy with a non-invasive approach. LANDIS-X is fully controlled with a custom-developed control unit based on a real-time technology. XRF pixel spectra are deconvoluted during the scanning and the elemental distribution images are available in a live mode to the users. Analytical results concerning the in-situ use of LANDIS-X for the non-invasive investigation of large dimension paintings and three-dimensional artworks will be presented.

Acknowledgments

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[1] F.P. Romano, C. Caliri, P. Nicotra, S. Di Martino, L. Pappalardo, F. Rizzo, H. Santos, *Journal of Analytical Atomic Spectrometry*, 2017, 32(4), 773-781.