

Advanced spectroscopy and microscopy studies for chemical elements evaluation by micro-X-ray Fluorescence and polycapillary optics

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Advances in x-ray techniques, including x-ray optics, have paved the way to obtain challenging results in several research fields thanks to the improvement in terms of spatial resolution. This is particularly true for x-ray fluorescence (XRF), where the combination of conventional x-ray sources with polycapillary optics has permitted to have high flux and high focused beams. However, XRF spectroscopy is mainly dedicated to qualitative studies while quantitative analysis still remains a strong hurdle mainly due to important matrix effects that affect the signal related to the chemical components under evaluation.

At LNF XLab Frascati the expertise, gained on x-ray techniques and on polycapillary lenses, has allowed researchers to carry out advanced μ XRF studies¹. RXR (Rainbow X-ray), is the experimental station dedicated to 2D/3D XRF micro-imaging and TXRF analysis, being equipped with 2 detectors of different energy efficiency and working in confocal mode with the source coupled with a full-lens and both the detectors combined with dedicated half-lenses, has allowed researchers to carry out advanced X-ray spectroscopy and X-ray microscopy studies². The potentialities of our RXR facility are showcased by depicting the results obtained in some application scenarios such as: a) chemical composition of tree rings for evaluating the influence of environmental context, b) study of a “fresco” fragment to assess the presence of damages³, c) pigment recognition within antique artifacts by the application of a quantitative method (FPM)^{4,5}.

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