

Development of a multiwavelength XRD combined with EDXRF for cultural heritage in-situ analysis

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Energy Dispersive X-ray Diffraction (XRD) and X-ray Fluorescence (XRF) have shown to be powerful tools to analyze all kind of samples, and especially for the analysis of samples of cultural heritage, geological and archaeological interest [1–4]. Due to exclusive setups, XRD and XRF are used independently yielding results not necessarily of the same spot and sometimes difficult to be combined. Ideally XRD and XRF should be performed together at the same spot. In this work we tested a prove of concept using a standard X-ray source (Cu rotate X-ray tube - Rigaku) and a proxy of an imaging X-ray detector employing a single detector (Si-PIN Amptek, 139eV@5.98keV, collimated to 1 mm diameter) and mounted on a computer controlled XY stage. The main advantage of the method is that no sample preparation is required and the XRF-XRD analyses are done simultaneously on the same spot. The time consuming is still large due to multiple single spectra acquisition (40x20). PyMCA [5] software was used to image the XRF signal, generating an homogeneous image, and the XRD signal, represented by bands in the hyperspectrum, similar to a Laue diffractogram. The next step is extracting the d-spacings compatible with the XRF analysis and possible quantitative results.

The XY stage as well the data acquisition software (written in Labview) were designed and executed by the technical staff of the laboratory LAMFI-USP (Laboratory for Ion Beam Analysis of Materials). The measurements were done at LabCr-USP (Crystallography Laboratory).

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