Poster

X-ray powder diffraction: a hub in the integrative study of the schematic Holocene rock art

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The study of neolithic schematic rock art, which is presence over a vast geographical area from the Iberian Peninsula to Italy and documented by more than 140 sites in southern France, constitutes an efficient way of approaching Neolithic societies. Material characterization is an essential step to study this kind of paintings, understand the provenance, chronology, know-hows, and graphic syntaxes. Otello (Saint-Rémy de Provence, Bouches-du-Rhône) and Eissartènes (Le Val, Var) rock shelters are two major sites selected for this study due to the large number of figures and the superpositions, the great range of hues and the presence of colouring matter in and around the site as well as the availability of micro-samples from prior studies. However, localization of the sites (30-minutes hiking) and the paintings (high), alterations (open shelter), and sampling difficulty (representativity, cultural heritage protection) are a lot of challenging for scientists. The cross-utilization of different non-invasive analytic technics in situ and on micro samples is required.

Coloring matters are mainly composed by geological matter possibly prepared or not. Rock panel is also made up of a lot of minerals related to alteration and/or the substrate. X-ray powder diffraction and crystallographic study are very efficient to identify, localized, and quantify them using Rietveld refinement. Analyses was performed on unprocessed sample and on cross sections, both results from earlier studies. We mostly work with synchrotron radiation on two different ESRF beamline to do High resolution powder diffraction (ESRF-ID22) and high-spatial-resolution diffraction (ESRF-ID13). Our experiments took place as part of beam time dedicated to Historical material Block Allocation Group (BAG) for cultural heritage.

X-ray powder diffraction combined with other technics as X-Ray fluorescence (XRF), which we perform in situ with the portable mobiflu instrument 1, can be used to identify and classify phases (Fig.1). In this way, we can specify the mineralogical composition of the coloring matter, alterations, and substrates. Integration of these results in a more global approach, will enable the mapping of materials on the wall-scale. In other words, in this presentation we will highlight the key role of crystallographic studies in a global approach to better understand schematic rock art through the presentation of select results.

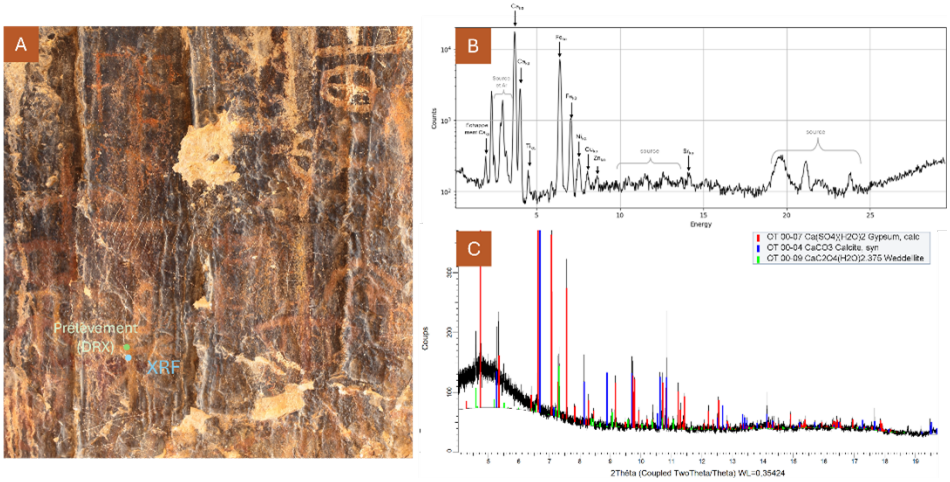

Figure 1 : (A) Photography of Otello schematic rock art with the localisation of XRF analysis and micro-prelevement, (B) XRF spectrum acquired with the portable X-ray spectrometer mobiflu (C) X-ray diffraction pattern acquired with the ID22 beamline at ESRF.

[1] Poline, V., Bordet P., Leynaud O., Prat A., Bruyère R., Blanc N., Lelong F., et Martinetto P. (2023.) A Mobile Instrument for Joint X-Ray Fluorescence and Diffraction Measurements on Complex-Shape Cultural Heritage Objects, pp. 138 The European Physical Journal Plus https://doi.org/10.1140/epjp/s13360-023-03821-9.