

Shed light on the schematic paintings of Savoy : the use of μ XRD to understand the painted wall

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Schematic prehistoric rock paintings, extending across the Iberian Peninsula to the Italian Piedmont, are mainly attributed to the Neolithic period from the archaeological context, whereas absolute dating has never been realized on the mineral pigments. The Rocher du Château (1750 m, Bessans, Savoie, France) is one of the western Alps sites which presents schematic paintings and appears as a key site to address chronological issue, due to the presence of coloring matter discovered during excavation and dating back to 4600-4000 BC. This context provides an unique opportunity to conduct an integrated study and to investigate the coloring matter used in the paintings.

One of the limitations of this study is due to the weathering process affecting the rock surface before and after the application of the paint. The presence of the mineral accretions or crusts limits the access to the coloring matter, either during *in situ* analysis (such as portable Raman) or during the analysis of micro-samples. However understanding these weathering processes makes it possible to respond to two challenges: (i) to distinguish the components of the pictorial material, (ii) to evaluate the possibility of dating the concretions and to propose a chronological interval for the realization of the paints.

A combined approach has been developed on the Rocher du Château site using both *in situ* methods and analyses of micro-samples and excavated coloring matter [1]. To understand the complex stratigraphy of the micro-samples and to identify the mineral accretion, the use of the μ XRD based on synchrotron radiation remains essential to identify crystalline phases in very small, fragile and complex objects. Thanks to the brightness of the micro-beam and the absence of preparation, the ID22 and D2AM beamlines of ESRF are very suitable to characterize the thinness ($< 5\mu\text{m}$) of the painting layers and the complex mixture of some coloring matter from the excavation. The anthropogenic origin of this complex mixture is confirmed by the presence of charcoal mixed with large muscovite, small rounded quartz, and potentially hematite.

Finally, we highlighted and explained here the taphonomic processes of the painted rock wall and determined the geological origin of coloring matter. This appears to be essential in order to reinforce comparisons between rock paintings and dated excavated pigments and other pigmented materials.

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References

[1] - Defrasne, C., E. Chalmin, L. Bellot-Gurlet and E. Thirault 2019. "From archaeological layers to schematic rock art? Integrated study of the Neolithic coloring materials at the Rocher du Château (Western Alps, Savoy, France)." *Journal of Anthropological and Archaeological Sciences* on line.