Structural studies of historical inorganic pigments using synchrotron radiation: capacities and future applications

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Omnipresent in paintings since the Antiquity, inorganic pigments are key materials of art history. Collecting accurate chemical information on them is thus essential today to achieve a better understanding of ancient pictorial practices, as well as to develop new conservation strategies. However, this objective faces a major scientific challenge: historical pigments are materials of high complexity. They were often obtained in the past through elaborate synthesis procedures, then mixed and used following the artists' know-how, which might no longer be known today. Finally paintings are dynamic systems: chemical interactions within paint layers can result in the *in-situ* formation of non-original crystalline compounds.

Among the multiple techniques available at synchrotron facilities, X-ray Diffraction (XRD) is particularly suited for the study of inorganic pigments. Relying on the analytical power of synchrotron radiation, XRD indeed enables to discriminate between the multiple inorganic products present in complex paint stratigraphies at the micrometric scale, but also to provide detailed information on their composition and microstructure. These results not only allow insights into the ancient artistic processes but also yield precious assets for the long term preservation of paintworks.

This talk will present recent research performed at several Synchrotron facilities, especially the ESRF, aimed at revealing the ancient syntheses of inorganic pigments, and deciphering the potential degradation mechanisms affecting historical pictorial matter. The communication will notably illustrate the complementarity of structural data collected using various analytical configurations, among them High-angular resolution XRD and High-angular resolution XRD.

Finally, by presenting some future challenges with potential ground-breaking impact in the study of historical artifacts, the communication will attempt to trigger discussion on the expectations from the Cultural Heritage community regarding the ESRF-EBS.