

In-depth study of pigments: development of a new analytical protocol with SR- μ TXRD

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Acquiring as many as possible information from heterogeneous micro samples of Cultural Heritage material, and specifically from painting stratigraphies, is an analytical challenge that leads to an increasing need to develop innovative analytical protocols, relying on the use of unconventional sources, such as synchrotron radiation.

In our research project, we aimed to optimise the experimental set-up for the use of synchrotron radiation micro-X-ray powder diffraction in transmission geometry (SR- μ TXRD) to develop a targeted protocol useful to analyse, with a high spatial resolution, the crystalline phases of pigments.

The high potential of SR- μ TXRD technique (carried out at the XRD1 beamline of the Elettra synchrotron (Basovizza, Italy) has been applied to lab-made, polychrome stratigraphies. We prepared samples as similar as possible to real painting stratigraphies: materials with 4 to 6 layers (a few tens of microns thickness) composed of a coarse and fine grain size mixture of crystalline phases such as carbonates, silicates, oxides and clay minerals.

From the dataset acquired, qualitative and quantitative observations were performed, considering for each pattern the different structural features, the abundance, and the grain size of the pigment phases. Such analytical approach, that combines a spatially resolved investigation with a high-quality mineralogical characterization, has provided data of remarkable importance for investigating morphological, structural and crystallographic characteristics of pigments, often hardly analysable inside multi-layered systems.