

## Synchrotron-based FTIR microscopy for the analysis of ancient artistic materials

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As exemplified by ancient paintings, ancient artistic materials are complex in terms of chemical analysis because they are usually made of organic/mineral, amorphous/crystallized, major/minor mixtures, evolving with time, and organized in micrometric multi-layered arrangements. In this context, synchrotron micro-imaging techniques offer a powerful analytical platform to reveal the two dimensional atomic, molecular and structural compositions of such complex systems, at a micrometer resolution.

FTIR spectroscopy is a very common way to determine the artworks composition. In particular, it is an ideal technique for the study of hybrid materials as it is sensitive to both organic and mineral matters. The combination of a microscope to FTIR spectroscopy was a decisive step for the study of paintings, and more generally of artistic materials, as it was then possible to see and to choose the location of the spectrum acquisition. The analysis was no longer obtained as an average over the whole sample; instead molecular images were accessible. In addition to offer “geographical” information, the imaging can be very useful for a better data treatment.

An even more decisive step was achieved thanks the synchrotron sources which provide a much brighter source compared to thermal sources. With such equipments, the beam size can be easily lowered below  $10 \times 10 \mu\text{m}^2$  without significant loss of flux. This point is essential for the discriminative analysis of each layer of the painting.

Different examples from the field of Cultural Heritage will be presented. The issue of sample preparation and experimental set-ups will be also addressed. We will also discuss the interest of combining this technique with micro X-ray imaging methods.