

SYNCHROTRON RADIATION IN ART, ARCHAEOLOGY AND CULTURAL HERITAGE

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The scientific investigations aimed to the archaeometric analyses, characterization and conservation of archaeological and artistic finds are in general based on a strong interdisciplinary approach, which implies the collaboration among scientists and archaeologists expert in many different fields. The knowledge transfer among researcher groups is in particular required by the huge amount of different conventional and advanced techniques which can be applied to the ancient materials and which imposes specific technical and scientific background.

One of the main requirements imposed by the archaeologists in the studies of ancient and precious materials is that the selected techniques must be non-destructive (or at most micro-destructive). In this scenarios, synchrotron radiation (SR)-based methods can play a central role, being specifically suitable for micro-non-destructive analyses. The SR-based investigations more widely performed in archaeometric studies are the following: a) elemental microanalysis down to the sub-ppm level is possible by means of X-ray fluorescence analysis; b) local chemical state determinations of selected (trace) constituents are possible by applying X-ray absorption spectroscopy; c) information on the presence, amount, and nature of crystalline phases can be obtained via X-ray diffraction; d) entire objects may be bathed in highly-energetic synchrotron beams to allow high quality radiographic or tomographic imaging measurements, revealing the internal structure of these artifacts.

This lesson is intended to show how SR-based experiments, employing highly brilliant and collimated micro-beams of X-rays, can be exploited by all these investigation techniques on archaeological and artistic objects, obtaining results with unprecedented space and energy resolution.