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Particle accelerators unravel Art and Archaeology issues

THOMAS CALLIGARO, Centre de Recherche et de Restauration des Musées de France, Palais du Louvre, Paris, France

Many analytical techniques are applied to get a better insight on art works and archaeological artefacts and to contribute to their conservation and restoration. Because of the precious and sometimes unique character of these items, non-destructive and non-sampling techniques are preferred. From this standpoint, the analysis with ion beams produced by accelerators (IBA), featuring good analytical performance and non-destructiveness, constitutes one of the best choices. Ion beams analysis techniques (IBA) introduced in 1957 have been constantly adapted to address art and archaeology questions; today the performances obtained directly on the object placed in the atmosphere rival with those achieved in vacuum. Since 20 years, AGLAE, the IBA facility of the Centre for Research and Restoration of the Museums of France located in the Louvre museum has contributed to this progress. The cornerstone of this development is a versatile external nuclear microprobe implementing PIXE, PIGE, RBS, NRA and ERDA methods for rapid expertises of art works and more extensive research works in art history, archaeology and conservation science. After an introduction of the physical principles of IBA, a virtual tour of this unique facility will be provided. The benefit of its use will be illustrated through two case studies, the first one dealing with the determination by PIXE of the provenance of painted works of the Spanish master Murillo and the second one with the authentication study using NRA of a mysterious archaeological rock crystal skull.