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P45 - Ion beam analysis of golden threads from Romanian medieval textiles

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Technical studies by classical analytical techniques routinely used for analysis of cultural heritage materials (XRF, SEM-EDX) and recently, more sensitive techniques like AES, XPS, SIMS and laser-ICP/MS, have been done previously in order to characterize the chemical nature and morphology of the metal threads from historical textiles. As these techniques proved to be limited for the study of the very thin, possible multilayered metal threads, further in-depth investigation was needed to be carried out by using the IBA techniques which are ideal by their features for this kind of research. The aim of our study carried out within the CHARISMA - Fixlab IBATEX and IBATEX 2 projects was to demonstrate the necessity of integrating the advanced IBA methods with the classical techniques, frequently used in museums, for an in-depth applied interdisciplinary research that brought new developments and rich accurate information on historical golden threads constituent materials, especially the trace elements, and their ancient production technologies. Samples taken from gold-brocaded velvets and religious embroideries (15th - 18th cent.) were wires and strips wrapped around a dyed or undyed silk core yarn and wires with no core yarns (IBATEX), also cross-sections obtained by embedding the metal threads in epoxy resin (IBATEX 2). Compared to classical techniques, IBA nuclear methods allowed a precise detection of the layered structures and an accurate identification of the trace elements (detection limits of few tens of ppms). PIXE results confirmed that both types of the metal threads studied –wires and strips –have a layered structure being made of gilded fine silver (refined by cupellation) and not of Au-Ag alloy, or gilded Ag-Cu alloy or Au-Ag-Cu alloy, as resulted from the previously performed SEM-EDX analysis. The elemental maps allowed us to identify the areas from which the metal threads structure and quantitative composition could be precisely determined. RBS results revealed that, in some cases, the gold layer is separate from the silver bulk by an interface layer that resulted by atomic diffusion of silver into the gold layer, which lead us to the conclusion that probably the methods used for gilding were the diffusion gilding or the fire gilding.

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