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An Ancient Egyptian Multilayered Polychrome Wooden Sculpture Belonging to the Museo Egizio of Torino: Characterization of Painting Materials and Design of Cleaning Processes by Means of Highly Retentive Hydrogels

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Abstract: This contribution focuses on the conservation of an Egyptian wooden sculpture (Inventory Number Cat. 745) belonging to the Museo Egizio of Torino in northwest Italy. A preliminary and interdisciplinary study of constituent painting materials and their layering is here provided. It was conducted by means of a multi-technique approach starting from non-invasive multispectral analysis on the whole object, and subsequently, on selected micro-samples. In particular, visible fluorescence induced by ultraviolet radiation (UVF), infrared reflectography (IRR) and visible-induced infrared luminescence were used on the whole object. The micro-samples were analysed by means of an optical microscope with visible and UV light sources, a scanning electron microscope (SEM) with an energy-dispersive X-ray spectrometer (EDX), Fourier transform infrared (FT-IR) spectrometer, pyrolysis-gas chromatography/mass spectrometer (Py-GC/MS) and micro-particle induced X-ray emission (PIXE). The characterization of the painting materials allowed the detection of Egyptian blue and Egyptian green, and also confirmed the pertinence of the top brown layer to the original materials, which is a key point to design a suitable surface treatment. In fact, due to the water sensitiveness of the original materials, only few options were available to perform cleaning operations on this artwork. To setup the cleaning procedure, we performed several preliminary tests on mockups using dry cleaning materials, commonly used to treat reactive surfaces, and innovative highly water retentive hydrogels, which can potentially limit the mechanical action on the original surface while proving excellent cleaning results. Overall, this study has proved fundamental to increase our knowledge on ancient Egyptian artistic techniques and contribute to hypothesize the possible provenance of the artefact. It also demonstrated that polyvinyl alcohol-based retentive gels allow for the safe and efficient cleaning of extremely water sensitive painted surfaces, as those typical of ancient Egyptian artefacts.

Keywords: cultural heritage; conservation; wooden sculpture; ancient Egyptian; ancient Egyptian painting materials; cleaning treatment; water based systems; poly(vinyl alcohol) hydrogels; archaeometry