

Analytical methodologies for the characterization of pigments from ancient Egyptian artefacts

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One of the most compelling and inspiring challenges in archaeometry is the identification of pigments in artefacts of historical and archaeological interest. Chemical-physical analyses allow the characterisation of the pigment's nature and possibly the origin and/or the manufacturing techniques employed. This information may enable a geographical and historical contextualisation and may also help in the dating of the artefact. Research studies conducted in this field were able to identify the vast array of colours the ancient Egyptians had at their disposal.

It is worth noting that every different shade was associated with a specific, symbolic meaning. The ritual and social use of colour resulted from theological beliefs, and every different hue had a precise, cultural value. This fact inevitably led to the utilisation of numerous pigments to decorate the works of art produced [1, 2].

The aim of this work was to characterise different samples of ancient Egyptian artefacts by identifying the employed pigments and highlighting, where possible, the presence of organic materials. The whole sample set was composed of sixteen fragments from three different artefacts coming from a private collection. A group of six micro-fragments were taken from the cover of an anthropomorphic sarcophagus belonging to the period between the XXVI and XXX dynasties. Seven other samples were collected from a wooden fragment of a different sarcophagus belonging to the Late Period of ancient Egypt (664-332 BC). Finally, three samples were obtained from the exterior and interior surfaces of a red container, better defined as a cylindrical wooden ciborium from the Imperial Roman period (I-III century AD).

The investigation of the fragments was conducted utilising a multi-analytical approach. The first observations of the pictorial textures were performed by optical microscopy. Then the semiquantitative determination of the elemental composition of the pigments was carried out by SEM-EDX (Scanning Electron Microscopy coupled with Energy Dispersive X-ray spectroscopy) analysis. Subsequently, investigations were carried out through molecular spectroscopic techniques, such as Attenuated Total Reflectance Infrared Spectroscopy (ATR/FT-IR) and Raman spectroscopy, to highlight the nature of the pigments. Finally, Visible Induced Luminescence (VIL) was employed as a further tool for pigment recognition. The VIL technique proved to be particularly useful in identifying Egyptian blue in the samples since it permitted the determination of its presence even where the other techniques did not.

This multi-technique approach applied to the study of the Egyptian fragments allowed the complete characterisation of the pigments used to decorate the artefacts. Also, some preliminary information about the presence of organic substances, both in the pictorial layers and in the sample coming from the ciborium's inside, was achieved.

References

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[2] L. Swartz Dodd, D. A. Scott, G. Artemis Nikias, J. Au, A. Ramos, The ritual significance of colour specialised pigments in a wooden Egyptian funerary statuette from the new kingdom, «The Journal of Egyptian Archaeology» 95 (2009), pp. 83-104.