

A study for the analysis of pigments from ancient Egyptian artefacts

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Like all pigments, those of the Egyptian period require their own analysis to be identified and thus understood. There are several testimonies and numerous studies that confirm the vast number of colours that the ancient Egyptians had at their disposal to decorate their works of art and strong also was the symbolic meaning they associated with each different hue.

In ancient Egypt the ritual and social use of colour was the result of theological speculations, and each different hue had a precise cultural value [1-2].

In general, the palette of the Egyptians consisted mainly of white, red, yellow, blue, green and black. To obtain the colouring substances, the pigment was first ground and then diluted with water or, also depending on the support, with oils, egg whites, gum arabic or resins [3].

The aim of the present work is to investigate the nature of sixteen samples of three ancient Egyptian artifacts, identify the pigments used and highlight the possible presence of organic materials.

The sample set is composed of fragments from three different artifacts from a private collection. The first six samples come from an anthropomorphic sarcophagus belonging to the period between the XXVI and XXX dynasties. The next seven samples come from a wooden fragment of another sarcophagus placed chronologically during the Late Period (664-332 BC). Finally, the last three samples come from a red container, better defined as a cylindrical wooden ciborium from the Roman imperial period (I-III century AD). The chemical characterization of the fragments was performed by using a multi-analytical approach. A first observation of the painting and an initial characterization of the chemical elements present in the pigments was carried out by SEM-EDX (Scanning Electron Microscopy coupled with Energy Dispersive X-ray spectroscopy) analysis. Subsequently, investigations were carried out using molecular techniques such as ATR-FTIR (Attenuated Total Reflectance Infrared) and Raman spectroscopies to identify the nature of the pigments. Finally, the samples were further investigated by using VIL (Luminescence Induced by Visible light) analysis, a technique that proved particularly useful in the identification of Egyptian blue.

As a result of the analyses carried out, inorganic pigments of different nature were found, and the presence of various organic substances, including polysaccharides, protein material and oils, was ascertained.

On the first artifact, the presence of Egyptian blue, red ochre, green earth and calcium carbonate were recognized, whereas, on the sarcophagus fragment, yellow ochre, green earth, chrysocollo, Egyptian blue, red ochre, calcium carbonate and carbon black were found. Lastly, in the third artifact, mainly organic products and the red pigment realgar were identified.

Therefore, this work made it possible to characterize the palette used to paint the three artifacts. In addition, the employment of organic binders for pigment application was highlighted. Finally, the identified colours were found to be compatible with what is reported in the literature for analogous artifacts, and some preliminary information about the presence of organic substances, both in the pictorial layers and in the sample coming from inside the ciborium, was achieved.

References

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