

Scientific Investigation for an Ancient Egyptian Polychrome Wooden Stele

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Abstract : The studied stele dates back to Third Intermediate Period (1075-664) B.C in an ancient Egypt. It is made of wood and covered with painted gesso layers. This study aims to use a combination of multi spectral imaging {visible, infrared (IR), Visible-induced infrared luminescence (VIL), Visible-induced ultraviolet luminescence (UVL) and ultraviolet reflected (UVR)}, along with portable x-ray fluorescence in order to map and identify the pigments as well as to provide a deeper understanding of the painting techniques. Moreover; the authors were significantly interested in the identification of wood species. Multispectral imaging acquired in 3 spectral bands, ultraviolet (360-400 nm), visible (400-780 nm) and infrared (780-1100 nm) using (UV Ultraviolet-induced luminescence (UVL), UV Reflected (UVR), Visible (VIS), Visible-induced infrared luminescence (VIL) and Infrared photography. False color images are made by digitally editing the VIS with IR or UV images using Adobe Photoshop. Optical Microscopy (OM), portable X-ray fluorescence spectroscopy (p-XRF) and Fourier Transform Infrared Spectroscopy (FTIR) were used in this study. Mapping and imaging techniques provided useful information about the spatial distribution of pigments, in particular visible-induced luminescence (VIL) which allowed the spatial distribution of Egyptian blue pigment to be mapped and every region containing Egyptian blue, even down to single crystals in some instances, is clearly visible as a bright white area; however complete characterization of the pigments requires the use of p. XRF spectroscopy. Based on the elemental analysis found by P.XRF, we conclude that the artists used mixtures of the basic mineral pigments to achieve a wider palette of hues. Identification of wood species Microscopic identification indicated that the wood used was Sycamore Fig (*Ficus sycomorus* L.) which is recorded as being native to Egypt and was used to make wooden artifacts since at least the Fifth Dynasty.

Keywords : polychrome wooden stele, multispectral imaging, IR luminescence, Wood identification, Sycamore Fig, p-XRF

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