A NON-INVASIVE STUDY OF GOLDEN ARTIFACTS FROM THE ARCHAEOLOGICAL SITES OF MYCENAE AND PYLOS, PELOPONESSE

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ABSTRACT

The present research work aims at the characterization of gold alloy artifacts dated back at the Late Helladic I-IIIA period (16^{th} - 14^{th} cent BC) and originated from the Grave Circle A located in Mycenae, Peloponnese, and the palace at Ano Englianos, Pylos, located in Messenia, Peloponnese. Today they belong to the Prehistoric Collection of the National Archaeological Museum of Athens. Due to great archaeological and artistic value of the under investigation golden artifacts, sampling or micro-sampling or even their transfer outside the museum environment for laboratory analysis were not allowed at all, therefore only in-situ analysis could be performed. For this purpose, a combined non-invasive analytical methodology was employed involving portable X-Ray Fluorescence (XRF) and VIS-NIR Fiber Optics Diffuse Reflectance Spectroscopy (FORS) techniques. In-situ measurements were performed with the use of XRF and FORS techniques at multiple spots on the surfaces of the golden objects in order to determine the bulk chemical elemental composition and the reflectance spectral characteristics of their alloys. The results identified the use of native gold alloy for the production of the golden objects containing high Au and lower Ag concentrations while Cu was detected as a minor element. The effectiveness of the combined use of XRF and FORS techniques for the in-situ identification of metallic objects alloy composition was confirmed in this study, offering key advantages such as instrument mobility and quick data collection and interpretation which are of utmost significance in the field of research in archaeology where the objects are unique and their integrity is of significant value. Complementary to the above mentioned analytical methodology, a non-invasive analysis of the weathering damages and the degradation evolution was performed in order to assess the preservation state of the artifacts, via Digital Image Processing using the Integrated Computerized Analysis for Weathering (ICAW) technique. The results allowed both the qualitative and quantitative description of the the decay distribution on the artifacts' surfaces.

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