Discovering peoples, cultures, and technologies: toward a non-invasive approach for the study of archaeological ceramics from the Phoenician necropolis of Monte Sirai and Pani Loriga (Sardinia)

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Archaeological ceramics are among the most investigated and studied samples in the field of archaeometry. The reason for this is that they hold a huge amount of information by means of which it is possible to reconstruct the cultural and technological context of the artifact's production. On the other hand, however, studying ceramic artifacts very often requires an invasive and destructive approach, compromising the study of all those artifacts that are musealized and of high archaeological and artistic value. In order to overcome these limitations, this study aims to provide a multi-analytical and non-invasive protocol to allow the full characterization of ceramic bodies. We selected two set of representative samples from locally produced amphorae, the first one dated back to the 6th BCE and coming from the Phoenician necropolis of Monte Sirai (Carbonia, Sardinia, Italy), and the second one from the Phoenician site of Pani Loriga (Santadi, Sardinia), dated back to the 8th and 7th BCE. The transition between invasive and non-invasive analysis requires a full awareness of the samples, in order to lay the roots for a reliable non-invasive ceramics analysis, this is why our ceramic samples were preliminary examined with conventional invasive analysis, such as petrographic thin-section observations under the polarised microscope, X-Ray powder diffraction with Rietveld full-profile fit and benchtop XRF.

Here, we present some preliminary data applied to the aforementioned class of materials obtained by non-invasive analytical protocols, such as XRD and pXRF, without any sample preparation, with the purpose to evaluate reliability and validity of the experimental data when compared with the results obtained applying invasive techniques on the same set of samples. It was also possible to apply, on those samples, analytical techniques with unconventional light sources such as μCT and XRD-CT, performed with synchrotron light radiation, paving the way for the study of archaeological ceramics with new micro- or non-invasive analytical methodologies.

The present work is part of a larger project aimed to consolidate the use of a multi-methodological approach to provide valuable information on production, trade and technology of ceramics in ancient societies, offering a valuable tool for archaeologist and conservation scientists to approach the Past minimizing the manufacts damages.