SEM-EDS X-ray compositional maps for minero-chemical characterization of ancient pottery: a first application on Adrano pottery (NE Sicily, Italy)

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In archaeology, the classification of ceramic materials is an essential procedure. Alongside the macroscopic examination of the pottery paste, the classical archaeometric methods in order to define *fabrics* consist in the petrographic analysis performed by optical microscopy (OM), which allows to define the mineralogical composition and the morphological features of the inclusions, and in the chemical analyses of the matrix by energy dispersive spectrometry (EDS). Recently, new analytical procedures by using scanning electron microscopy (SEM) coupled with EDS have been applied to archaeometry in the fields of pottery petrography (*i.e.*, Knappett et al., 2011). Several computer controlled procedures were proposed, principally for image analysis and automated mineral analysis (Nuspl et al., 2004). Finally, specific systems (LEO, 1999) provide automatic modal analyses.

In this work new analytical SEM-EDS protocol, based on the acquisition of multi-elemental X-ray maps is presented. After thresholding, the detected particles are stacked in a data-base and processed by a dedicated software program which calculates the modal percentage of each selected phase by its chemical composition. Despite long acquisition time necessary to obtain a good spatial resolution and a good statistical precision, the dataset allows detailed description of mineralogical inclusions, their chemical composition, porosity and matrix. In this way, quantitative chemical and petrographic parameters can be obtained and used to help classifying ceramic sherds. Moreover, the amount of collected data allows to provide statistically reliable information. In addition, the developed procedure (both data acquisition and processing) is semi-automatic and therefore not depending by the operator interpretation. Finally, a comparison of chemical and petrographic data is possible, being the detected mineralogical phases expressed in compound% and represented by a modal analysis table. The procedure was tested on a set of sherds of black glaze pottery (4th to 2nd Centuries B.C.) from the site of Adrano (NE Sicily, southern Italy).

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