CHARACTERIZATION OF RED-SLIPPED POTTERY FROM ANCIENT CASSOPE
A PRELIMINARY COMPOSITIONAL STUDY

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INTRODUCTION

Examination of ancient pottery by physico-chemical analytical methods has proved to be a valuable complement to many archaeological investigations. Compositional studies, in particular, provide a basis for grouping pottery according to similarities in chemical data. Items produced using the same raw materials and the same "recipe" may be identified and a chemical "fingerprint" may be established for pottery that represents a particular period of time and a geographical area of production.

In a previous study, a first attempt to characterize pottery from archaeological sites in Epirus (NW Greece) was documented [1].

As part of an ongoing research, the present work reports on the compositional analysis of 38 red-slipped pottery sherds from ancient Cassope.

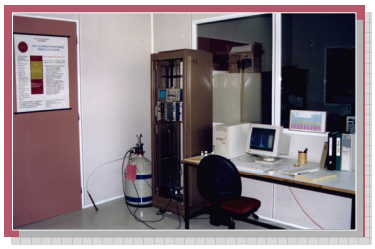
Cassope was founded around the mid 4rth century BC and flourished during the 3rd and 2nd century BC. The city declined following the conquest of Epirus by the Romans in 168 BC and was finally abandoned in 31 BC.

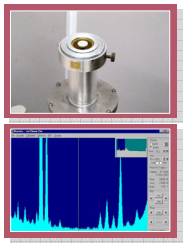
Large amounts of pottery were recovered during excavations initiated by the Athens Archaeological Society and resumed by the University of Ioannina in collaboration with the German Archaeological Institute. The items selected for this study were assigned to "local" red-slipped (LRS) pottery, Eastern Sigillata A (ESA) and Western Terra Sigillata (WTS) and dated from the 2nd to the 1rst century BC [2].

MATERIALS & METHODS

The concentrations of 17 major, minor and trace elements (K, Ca, Ti, Cr, Mn, Fe, Zn, Rb, Sr, Y, Zr, Pb, Ba, La, Ce and Nd) were determined in the ceramic bodies using radioisotope-induced energy-dispersive X-ray fluorescence (EDXRF) spectroscopy.

Annular radioisotopic ^{109}Cd and ^{241}Am sources were used for sample excitation, fixed coaxially above a Si(Li) detector in a 2π geometry. Compositions were assessed with reference to the certified SOIL-7 material provided by the IAEA.





The compositional data were submitted to principal component analysis (PCA) in order to identify structure in the sample set. An additive logratio transformation [3] was applied to the elemental concentrations, using the chemical element that introduces the lowest variability in the dataset as a divisor. PCA based on a variance-covariance matrix was carried out employing algorithms in the STATISTICA (v. 6.0) software package.

RESULTS & DISCUSSION

The elemental compositions reveal a considerable spread, which does not result from counting statistics or method precision; it rather implies pottery from different production sites or reflects the natural inhomogeneity of local clay deposits and the application of different manufacture processes in local workshops.

The PCA applied to the transformed data, revealed three main groupings (Fig. 1 & Table 1). The loadings' plot indicates that CAS-1 is isolated due to high concentrations in rare earth elements (REEs), whereas the distinction of CAS-2 arises from a strong Rb deficiency and a considerable Ca abundance. Group CAS-3 exhibits a rather elevated content in some transition metals, especially Cr and Fe.

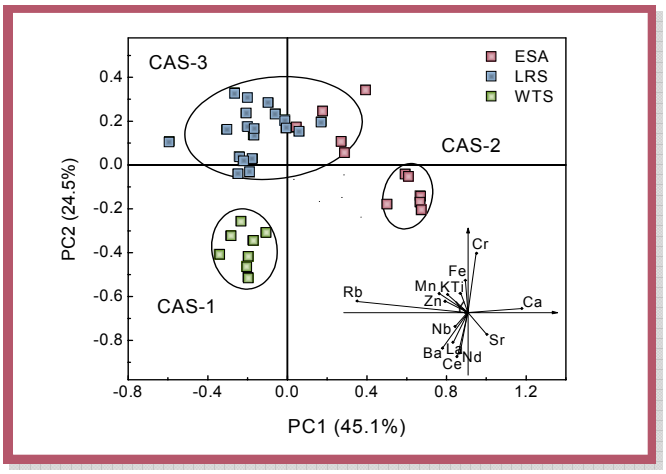


Fig. 1. The PC1-PC2 scatter plot reveals three groups; ellipses indicate their 95% confidence boundaries. Group CAS-1 is composed of WTS samples, CAS-2 includes about half of the ESA sherds and CAS-3 gathers the remaining ESA and the LRS fragments. The loadings' plot (inset) indicates the effect of the elemental variables on the PC coordinates.

The distinct REEs profile of CAS-1 implies the use of raw materials from different mineralogical sources, since the REEs provide valuable information for discriminating between different geochemical environments. Combined with archaeological evidence, these sherds, classified as Western Terra Sigillata, are considered to be imported pottery.

Provenance information can not be firmly argued for group CAS-2, as its separation is controlled by chemicals elements (Rb and Ca), which are primarily related with the refinement of raw materials during paste preparation. Therefore, the distinction between CAS-2 and CAS-3, i.e. Eastern Sigillata A and local red-slipped pottery, allows the conclusion that the two types of sherds were manufactured using different recipes. Nevertheless, the vessels are of the same shape, which is common for red-slipped pottery of the late Hellenistic period.

Further examination of the sherds by means of X-ray diffraction (XRD) and scanning electron microscopy (SEM) is underway, in order to study the mineralogical composition and the morphology of the surface coatings and extract technological information.

Table 1. Average concentration values (M) and standard deviations (σ) for the three groups established by PCA. M in μg g^{-1}, unless indicated otherwise; σ in % of M.

	CAS-1 (n = 8)		CAS-2 (n = 6)		CAS-3 (n=24)	
Element	M	σ(%)	M	σ(%)	M	σ(%)
K (%)	1.42	16.8	0.85	11.3	1.51	19.1
Ca (%)	5.74	13.8	9.79	4.9	6.80	31.0
Ti (%)	0.55	10.1	0.40	7.1	0.61	17.1
Cr	89	24.6	106	15.3	164	22.2
Mn (%)	0.15	25.9	0.08	9.2	0.16	18.7
Fe (%)	5.74	3.8	5.26	5.7	7.96	10.6
Zn	131	11.3	86	10.5	136	22.7
Pb	39	49.7	26	47.6	54	52.8
Rb	68	11.6	10	11.0	55	36.7
Sr	281	11.9	285	3.6	227	19.9
Y	26	9.2	18	16.4	23	15.0
Zr	153	8.4	104	9.3	135	15.2
Nb	23	17.8	11	16.9	16	19.3
Ba	366	8.2	172	31.9	230	18.1
La	23	5.8	12	9.8	15	21.1
Ce	67	4.5	35	7.9	36	10.1
Nd	17	7.6	9	7.1	10	17.2

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