



Preliminary Studies for a New Approach of Aes Rude Weight Valuation

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Abstract

The application of a system to attempt the calculation of value of *aes rude* copper from the Etruscan sanctuary of Pyrgi, starting from chemical analytical data, to be traced back to a value of its original weight. The analytical approach foresees the possibility to analyse, by SEM/EDS, the chemical composition of the different layer produced by corrosion processes, and to evaluate from the thickness measurements, their influence on the original weight starting from density parameters [1].

Introduction

In the different regions of Italy, especially central and northern Italy and Sicily, there are many examples of *aes rude* discovered in votive contexts, headstones, warehouses or storage rooms dating during the first millennium BC. These particular metal objects had presumably a function pre-coinage (more precisely, as a medium of exchange) and were fractionated in the use according to the needs. They can present in all forms of irregular, of various sizes, being mostly of pieces unrefined directly arising from melting, without any processing. Their value is dependent from the mass of each *aes rude* having such a function object pre-coinage. There is no doubt that the identification of a reference weight is essential as the revealing studies so far carried out by Professor Nicola Parise on the *aes rude* fragments found in the Etruscan sanctuary of Pyrgi (Rome). Each piece of *aes rude* would thus its importance in terms of weight having been cut to a specific unit, those at issue in the work of Prof. Nicola Parise would range between a precise set of subdivision as the Phoenician and Etruscan.

An important starting point of the research is to be found in the concept of inevitable deterioration: the *aes rude* will tend to undergo to corrosion phenomena with a consequent alteration of the metal external layers. Appears, therefore, of fundamental importance to go back to the original weight of such objects, through the application of a calculation system, starting from the volume of *aes rude* by assuming that no fragmentation occurred to the metal, and to reconstruct the exact weight even if in the presence of products of deterioration by measuring the composition and the thickness of each layer of corrosion product. The first steps of the analytical procedure therefore the not easy volume calculation while further steps are devoted to the evaluation either of the weight of the copper portion not affected by corrosion either that of copper oxides layers present in different states.



Fig. 1; Jar with *aes rude* from the southern Etruscan sanctuary of Pyrgi dated in the early fifth century b.C..

Materials & Methods

The sample of *aes rude* come from the Etruscan sanctuary of Pyrgi, Santa Severa, Italy.

SEM/EDS measurements were performed by a LEO1450VP coupled with a INCA300 (OXFORD)

Density was measured using a Mettler Toledo balance, mod B502-S (Mettler, USA) with 0.01 g resolution o Gibertini E50S (Gibertini, Milano, Italy) with 0.0001 g resolution coupled with a PC equipped of suitable software for data acquisition.

SEM/EDS measurements were performed on the sample such as while, for the density measures, it was subjected to cycles of drying at 65 ± 5 °C in oven (Galli Thermostatic Oven mod M710, Milan, Italy) and weighing until constant weight.

Results

The application of the analytical procedure for a fragment of *aes rude* copper used as a sample study has highlighted a weight value higher than those of the *aes rude* as found in the archaeological site, but in particular the valuations on the presence of gaps and deficiencies caused by widespread phenomenon of deterioration and corrosion, has been compared with samples as reference material, by showing a good accordance in the weight values.

Conclusions

The procedure assessed in the present work with success can now be applied, to the big amount of *aes rude* found in Pyrgi Sanctuary by allowing to operate a more realistic and objective classification of these particular finds whose weight value is the basis of their nature, thus reconstructing an exact economic system in use in Italy of the first millennium BC.

References

- 1) S.H. Plattner, R. Reale, G. Visco, M.G. Papa, M.P. Sammartino, Proposal of a new analytical procedure for the measurement of water absorption by stone. Preliminary study for an alternative to the Italian technical normative NORMAL 07-81, *Chem. Cent. J.*, (2012) 6(62) 1-8