

## ARCHAEOLOGICAL STUDY ON CERAMICS FROM POMPEII: PROVENANCE AND TECHNOLOGICAL ASPECTS

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### INTRODUCTION

The PhD research study focused on the archaeometric characterization of different ceramic samples found in Pompeii during the I.E. (Impianto Elettrico) excavation in 1980-1981. The archaeological investigations, carried out in the western part of the forum during the installation of the electric cables, revealed numerous useful materials for the reconstruction of the first stages of the site (Arthur, 1986; Cottica & Curti, 2008).

The ceramics analyzed, were selected by three major ceramic classes, widespread in everyday life and in the ancient Mediterranean trades: *i*) common ware, *ii*) black-glaze pottery, and *iii*) votive material. Archaeometric study aimed to have information related to Pompeii ceramic production, its social organization and the possible trade exchanges of finished objects.

#### *Common wares*

The common ware (both cooking ware and plain ware), is certainly the most attested production. The great variability of ceramic shapes and fabrics, in particular for cooking ware, suggested a wide diffusion in Pompeii, of objects from different productive areas.

The first part of the study involved the petrographic, mineralogical and geochemical characterization of cooking ware, produced in Pompeii and dated in a wide time span (IV-I centuries BC). The petrographic comparison between two groups, *group A* (IV-III century BC) and *group L* (II-I century BC), evidenced the presence of the same mineral phases and fragments of volcanic rocks, related to Somma-Vesuvius activity. The differences, are shown in particular, in the higher content of the coarser fraction in the temper of *group L* (II-I century BC), suggesting changes in the production technology.

The second part of the research, focused on the comparison between the II-I century BC pottery (*group L*) and two coeval groups of ceramics (*group E* and *group F*) characterized by the same ceramic shape but different fabric. The petrographic analysis distinguished a volcanic fabric for *group E* and a granitic fabric for *group F*. For the latter one, Calabria or Sardinia were supposed as probable provenance areas, considering the different geological characteristics of the Campanian region. However further analyses are necessary to confirm these hypotheses. The temper of *group E* showed a petrographic similarity to the Vesuvian ceramics (*group L*; Fig. 1). Plagioclase, sanidine, clinopyroxenes, amphibole, biotite and a large amount of volcanic rock fragments, were observed in both sets of ceramics. The *group E* (Fig. 1 a, b) is characterized by a lower presence of mafic minerals (in particular of clinopyroxenes) and a higher content of silic minerals (plagioclase, sanidine, and quartz) than *group L* (Fig. 1 c, d).

On the basis of petrographic characteristics, the Vesuvian provenance was not excluded for *group E*. This mineralogical assemblage is common to several scoriaceous pyroclastic-flow and pyroclastic-fall deposits of the volcanoes of the Campanian province, Vesuvius, Campi Flegrei, and Roccamonfina as well as Roman province including the Vulcini, Vico, and Monti Sabatini volcanic districts (Peccerillo & Turco, 2004; Marra & D'Ambrosio, 2013). It excludes the Alban Hills, whose products lack plagioclase and k-feldspar phenocrysts (Gaeta *et al.*, 2006).

In order to have information on the provenance of the examined ceramics, LA-ICP-MS coupled with SEM/EDS analysis were performed on specific mineral phases (specifically clinopyroxene crystals) within the inclusions of the ceramics. The data were compared with the same mineralogical phase in rocks from the districts of Roman (Vulsini, Vico, and Sabatini) and Campanian Provinces (Somma-Vesuvius and

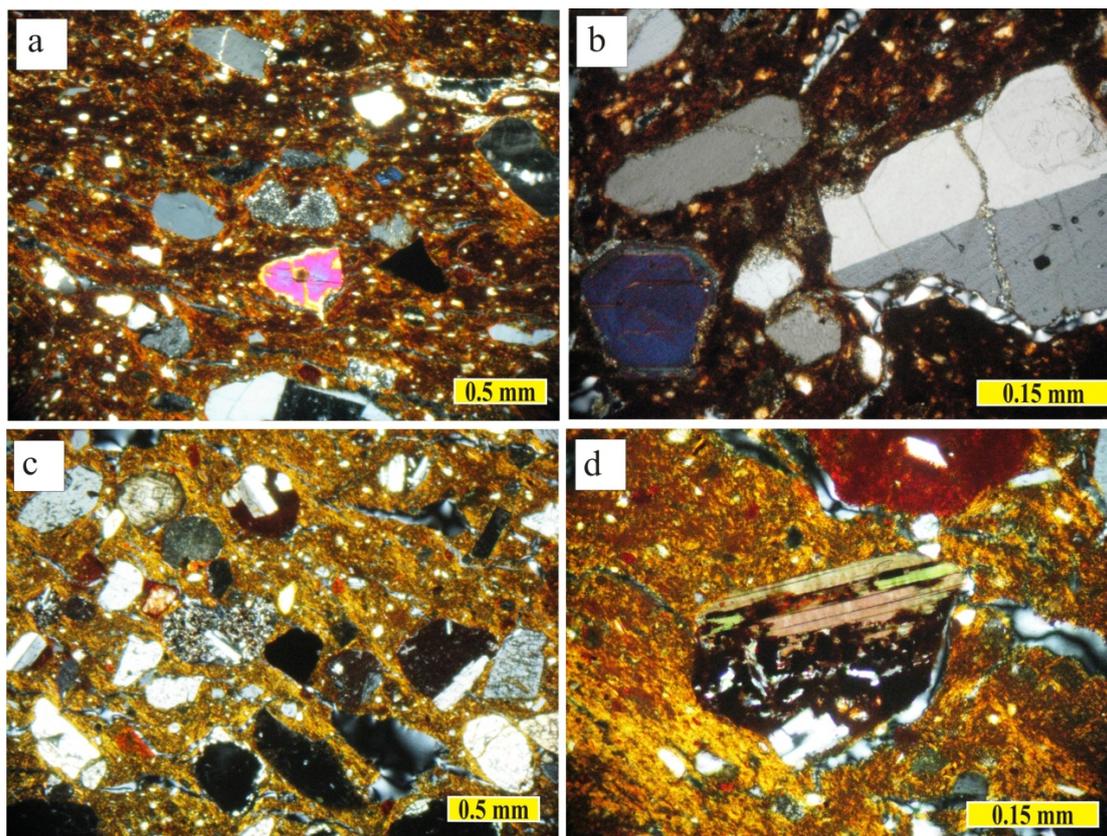


Fig. 1- Micrographs showing some optical properties of the representative group E and group L ceramics: a) group E, matrix and volcanic inclusions (sanidine, clinopyroxenes), XPL (15x); b) group E, volcanic inclusions (sanidine, pyroxene), XPL (60x); c) group L, volcanic fabric (clinopyroxenes, volcanic inclusions), XPL (15x); d) group L, volcanic inclusion, XPL (60x).

Roccamonfina). This method was considered as a good discriminant tool in recent works (Comodi *et al.*, 2006; De Rosa *et al.*, 2008, Barone *et al.*, 2010).

Some trace elements, detected by LA-ICP-MS (V, Sr, Zr, Y, and REE) were selected to discriminate each group of ceramics and the pyroxenes of the high potassic volcanic districts of central Italy (Campanian and Latium provinces). The comparison between the pyroxenes of ceramics and rocks by statistical analyses (binary diagrams and multivariate analysis, PCA), confirms the compositional similarity between the pyroxenes in *group L* (considered as local production) with those within the Campanian rocks, and the similarity of the *group E* pyroxenes with those occurring in the Latium rocks.

The good potential of this method was extremely useful to confirm the local provenance of *group L* and to indicate a probably source area for *group E*.

#### *Black glaze potteries*

The black glaze pottery is dated in a wide time span (IV-I century BC) and it was considered, on the basis of archaeological evidences (presence of misfired potteries and furnace spacers), of Pompeii production. The possible furnace of production has not been found, yet and the provenance attributions, by morphological analysis, are not sure because of the fine fabric. Archaeometric analyses were performed in order to corroborate the hypotheses and to clarify the technological changes during over three centuries.

Two different groups of ceramics dated to the IV-III century BC (*group A*) and II-I century BC (*group B*) were selected for the analyses. No compositional differences were detected by petrographic and chemical (XRF)

analysis whereas the mineralogical and morphological investigations on black glazes, by SEM/EDS and Raman microscopy, evidenced variations clearly due to different firing conditions.

The *group A* is characterized by a sintered coating in which small crystals of iron oxide are widespread (Fig. 2a). Magnetite, hematite, and hercynite represent the mineralogical phases recognized by Raman microscopy.

The *group B* is characterized by a completely vitrified glaze (Fig. 2b) containing only magnetite. The observed differences are related, probably, to the firing practice, in particular as regards the reducing step (the duration of this phase and the values of the temperature) and the cooling rate (the results are published in Scarpelli *et al.*, 2014).

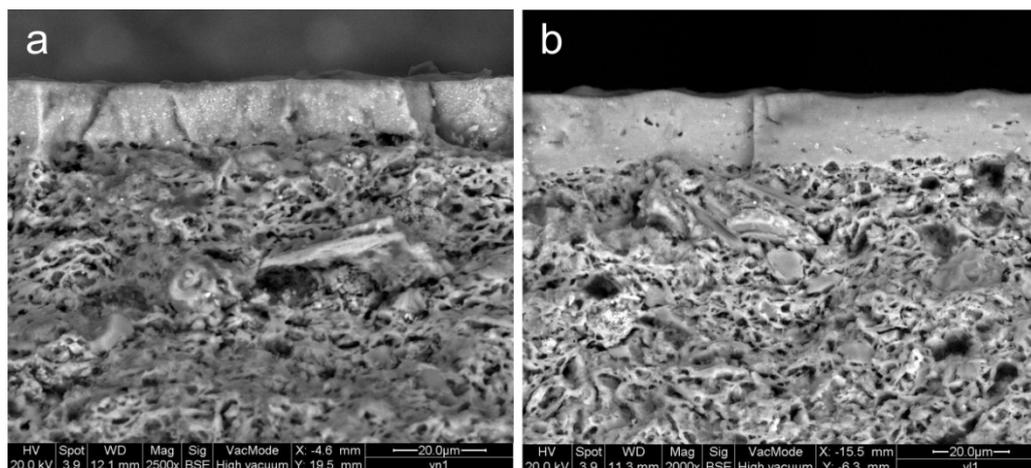


Fig. 2 - SEM images in BSE (backscattered electrons): a) group A sample; b) group B sample.

Finally, in order to confirm the hypothesized origin from Pompeii, clayey materials, sampled near the archaeological site, were analysed chemically and compared with ceramics by statistical methods. On the basis of archaeological indications (Peña & McCallum, 2009) and the geological characteristics of the studied area, clayey sediments were individuated in the Salerno province, at Ogliara and Montecorvino Rovella. The sampled calcareous materials (15% CaO), belonging to the Mio-Pliocene sedimentary sequence of the Salerno basin, show a large compositional similarity with the analyzed ceramics, confirming the hypothesis of Peña & McCallum (2009).

The results allowed to attest, for the first time, a production of black glaze ceramic at Pompeii and secondly suggested some considerations relating to the management of ancient quarries in the area of Salerno, used probably by potters in a quite extensive area.

#### *Votive materials*

The study on the votive material was performed in a preliminary phase. *Thymiatheria*, figurines and miniature vessels characterized by different shapes and fabrics, were analyzed. On the basis of archaeological assumptions, these materials could be considered as production for devotees, of workshops (not yet identified) inside the ancient Pompeii.

Petrographic analyses confirmed compositional differences in each group and between the three different products, and allowed us to indicate the employment of more raw materials (fine clays, clays and volcanic temper, and weathered volcanic deposits) for their production. The results could ascertain the presence of more ceramic ateliers specialized in the production of different potteries or, simply, verify the supplying of clayey materials from various sources in the Vesuvian area.

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