

Opinion

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The Contribute of Minero-Petrographic and Chemical Studies in Archeoceramics



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Opinion

Ceramics are the most diffused artifacts in archaeological context; being a daily-use artifact, these remains usually offer the possibility to investigate a wide range of dynamics, involving commercial routes, habits, moods, as well technological knowledge of an ancient societies. The study of archaeological ceramics often involves different disciplines, namely from archaeology to physic, chemist and geology. The numerous questions related to archaeological artifacts, usually synthesized in the well known questions about how, where and when an artifact was produced imply often not only the contribute of scientific expertise, but also the application of methods able to investigate materials at different scale of observation. In the case of ceramics, this require the application of multi-disciplinary and multi-scale techniques, to inspect materials from macro-scale to micro-scale.

The basic approach to archaeological ceramics consists in the typological classification, allowing to discriminate materials on the basis of context, shape, decoration, style, color and grain size. Beside some rare and peculiar cases, for which a ceramic artifact could be related to a specific workshop and/or geographic and historical context, the only naked-eye observation, however, is not enough to characterize raw materials, as well obtain information on manufacture technology and provenance. Even a ceramic could appears like homogenous, being the result of a more or less accurate mixing of clayey material and eventually tempers, processes as manufacture, firing, use and burial conditions often determine a range of variability into the ceramic paste which characterization can be achieved by petrographic, mineralogical and chemical studies, also coupled with more advanced methods.

In the case of coarse-grained ceramics, characterized by the occurrence of tempers usually consisting in polycrystalline rock fragments, the thin section analysis can offer quite relevant effort in provenance studies; in fact, the presence of mineral assemblages typical of a geographic and geologic context represents a quite certain signature for correct attribution. This is the case, for examples, of Sicilian productions exhibiting

metamorphic rocks fragments as tempers, for which a Peloritane area production can be suggested [1], or the well-known Pantelleria ware, in which the occurrence of sanidine, pyroxene and aenigmatite are typical of volcanic local rocks [2-3]. Coupled petrographic and chemical study can address more and more information on provenance, as in the case of mineral chemistry of volcanic pyroxenes, able to discriminate pottery produced by using materials from different volcanic Italian provinces [2] see also the website <https://sites.google.com/site/archaeometrypottery/>.

Even if useful to support dissertation on provenance and manufacture, allowing to discriminate fabrics and ceramic groups [4], petrographic observations cannot resolve mineralogy of clayey sediments as well the presence of minerals considered firing temperature indicators [5-6]. To achieve these aims, mineralogical analysis can provide fundamental information, especially if coupled with micro-morphological observation with the support case of chemical data [7]. Of course, the aforementioned approach is not so trivial in the case of fine-grained ceramic, in which the absence of tempers prevents provenance hypothesis on the basis of the solely petrographic observations. In this case, chemical analysis and the comparison with reference materials of a certain local production (laboratory tests made with clay sediments, kiln wastes and common ceramic) provides indispensable information [8-9]. The creation of reference groups appears, in this prospective, fundamental for further provenance studies [10].

With these drawbacks, it is quite clear that for a basic knowledge of archaeological ceramics cannot exclude a basic petrographic, mineralogical and chemical characterization. However, the technological advancements and the possibility to perform in deep analysis can of course improve archeological investigations. This is the case of the application of non-destructive and non invasive methods, also portable ones for in situ analysis, on precious and rare artifacts for which questions on decorations can be inspected [11], or the use of advanced techniques able to inspect nanometric texture of ceramics to achieve information on firing processes [12-14].

Conclusion

In conclusion, with this brief overview, we have rapidly flight over the opportunities offered by geosciences to archeoceramic studies, highlighting how the application of an analysis routines cannot disregard aspects as typology and textural features of archeological ceramics, as well possibility to collect representative specimens to analyse or perform in situ non destructive studies.

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