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Matching sherds to vessels through ceramic petrography: an Early Neolithic Iberian case study

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ABSTRACT

Ceramic re-fitting has traditionally focused on linking sherds to vessels using their formal features or decoration. This paper presents an innovative procedure designed to test such associations using ceramic thin section analysis. An assemblage of the earliest hand-made ceramics from central Iberia dated to the second half of the 6th millennium BC was used as a test case. First, the whole ceramic assemblage was subjected to macroscopic morphological sorting, taphonomic evaluation and a re-fitting operation. These tasks led to the recognition of both secure physical joins and probable matches. 16 sherds, representing 8 pairs, were selected from among those probable matches. These samples were investigated by thin section petrography and the photomicrographs processed using digital image analyses to produce qualitative mineralogical and quantitative textural data for assessing the likelihood of each pair belonging to the same vessel. The results show the potential of this strategy for matching sherds to vessels, as well as its reliability and wide applicability.

1. Introduction

Pottery re-fitting constitutes a well tested and efficient post-excavation analytical method, becoming widespread in the last decade (e.g. Sullivan, 1989; Bollong, 1994; Garrow, 2006; Edwards, 2012). This is the most suitable strategy to address important archaeological questions, such as stratigraphic and formation processes, the cultural choices related to the management of waste, or the in-depth characterization –temporality, scale, frequency, etc–of past depositional practices. This approach was originally borrowed from the *chaîne opératoire* method, aimed at reconstructing Palaeolithic technological débitage (Chapman and Gaydarska, 2007: 85–87). Lithics and ceramics are, however, very different archaeological materials whose methods of study are often not interchangeable. Thus, an uncritical reliance on the original lithic studies has been detrimental to the development of ceramic re-fitting. Particularly, sherd-links have been addressed through an almost exclusive emphasis on diagnostic sherds, such as rims, carinations, bases, etc., since 'body sherds are often impossible to match' (Orton and Hughes, 2013: 266). Moreover, the focus for linkages is most often on sherds that can be directly adjoined or matched. This perspective has narrowed the understanding of results achievable from sherd re-fitting, leading to an underappreciation of the broad informative potential of this practice (Blanco-González and Chapman, 2014). Indeed, secure ceramic matches constitute a rare, random and unrepresentative subset (Sullivan, 1989: 104) out of the array of associations actually recognizable between potsherds, necessitating the development of methods that can securely identify these associations.

The above shortcomings have rarely been addressed by scholars. Bollong's scoring method (1994: 17–19, Table 1) is one of the few and most notable contributions on this subject to date. This author defined six types of sherd-to-vessel associations ranging from actual physical refits to more uncertain linkages and isolated examples with no association in the assemblage, known as 'orphan' sherds. However, his scheme relies heavily upon visual impressions expressed in qualitative indexes, inhibiting an independent evaluation of the results. Moreover, Bollong does not pay adequate attention to body sherds with no physical matches, which represent the bulk of potsherds in any ceramic assemblage. Ceramic thin section analysis could be a strategy well suited to

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Table 1
Ceramic samples from La Lámpara, stating their archaeological context, description and the questions addressed through their study.

Sample	Accession no.	Context	Reference	Description	Addressed questions
A	97/8/C/175	Pit 1	Rojo et al. 2008: 158, Fig. 130, no. 8	Incised rim sherd with light orange surfaces	Sherds from the same hemispheric bowl in different pits (25 m apart)?
B	99/197/E-404/1	Pit 3	Rojo et al. 2008: 158, Fig. 130, no. 3	Incised rim sherd with homogeneous dark color	Differential post-breakage alteration (by fire in Sample A)?
C	2001/125/3.2.1.2	Pit 9	Rojo et al. 2008: 150, Fig. 122, no. 10	Grooved body sherd from a hemispheric bowl with homogeneous light brown-orange color	Sherds from the same hemispheric bowl within the same Pit 9? Differential post-breakage alterations by fire?
D	2001/125/3.2.1.1	Pit 9	Rojo et al. 2008: 150, Fig. 122, no. 4	Grooved rim from a hemispheric bowl with uneven gray color	
E	99/197/E-406/4	Pit 3	Rojo et al. 2008: 150, Fig. 122, no. 11	Grooved rim from a hemispheric bowl with even gray color	Sherds from the same hemispheric bowl in different pits (30 m apart)? Differential post-breakage alterations
F	2001/125/2.13.12	Pit 13	Rojo et al. 2008: 150, Fig. 122, no. 7	Grooved rim from a hemispheric bowl with uneven gray color and clear post-breakage sooting	(by fire in Sample F)?
G	2001/125/7.5.1.2	Pit 17	Unpublished	Coarse, handled, body sherd with gray color, rounded edges, porous surfaces and intense fire disturbance	Sherds from the same coarse handled vessel within Pit 17? Differential post-breakage alterations (abrasion and fire in Sample G)?
H	2001/125/7.6.1.3	Pit 17	Rojo et al. 2008: 139, Fig. 114, no. 2	Coarse, handled, body sherd with homogeneous color, fresh edges and smooth polished surface	
I	99/98/D-302/14	Pit 2	Unpublished	Plain body sherd with light orange color	Sherds from the same vessel in different pits (45 m apart)? No post-breakage
J	99/98/B-202/82	Pit 10	Unpublished	Plain body sherd with light orange color	alterations
K	2001/125/2.3.1.2	Pit 13	Rojo et al. 2008: 158, Fig. 130, no. 4	Incised rim dark gray sherd, worn surfaces and breaks.	Sherds from the same bowl in different pits (10 m apart)? Differential post-
L	2001/125/1.1.1.1	Pit 18	Unpublished	Incised body light gray sherd	breakage alterations (abrasion in Sample K)?
M	2001/125/2.11.1.4	Pit 13	Rojo et al. 2008: 163, Fig. 134, no. 2	Incised rim sherd with pale orange color	Sherds from the same hemispheric bowl within the same Pit 13?
N	2001/125/2.10.1.3	Pit 13	Rojo et al. 2008: 163, Fig. 134, no. 3	Incised body sherd with dark gray color	Differential post-breakage alterations by fire?
O	2001/125/2/11/1/1	Pit 13	Rojo et al. 2008: 140, Fig. 115, no. 1	Irregularly fired rim sherd from a large vessel with impressed lip and impressed plastic applications, fresh edges and fractures	Sherds from the same large decorated vessel within the same Pit 13? Differential post-breakage alterations (abrasion in Sample P)?
P	2001/125/2/12/1/2	Pit 13	Rojo et al. 2008: 140, Fig. 115, no. 1	Irregularly fired rim sherd from a large vessel with impressed lip and impressed plastic applications, eroded edges and fractures	

tackling these concerns; it has been widely used to characterize pottery production technology and even post-depositional alterations (e.g. Orton and Hughes, 2013: 172–173; Quinn, 2013: 204–210). Yet, petrography has never been deployed to characterize the pre-depositional processes that take place between the time vessels are fractured and their definitive discard. This paper contributes towards this endeavor. First a visual assessment and a re-fitting operation were carried out with a collection of hand-made ceramics. Then, 16 non-conjoining paired sherds were selected, sectioned and petrographically examined. Subsequently their photomicrographs were processed through digital image analyses. A scanning electron microscope was used to compare the nature of some mineral inclusions. This procedure has allowed for the testing of several hypothetical sherd-to-vessel associations with important consequences for understanding how these ceramics entered the archaeological record. This new method suggests that there is much to learn from these often disregarded stages of the life-cycle of archaeological ceramics, which have been referred to as their 'life after the break' (Chapman and Gaydarska, 2007: 81–112).

2. Materials and methods

An awareness of the above mentioned issues prompted the design of an alternative method. This method focuses on non-adjoining sherds irrespective of their shape or quality and pays special attention to the terminal steps of their use-lives, i.e. after they became detached fragments. A threefold procedure was developed that combined mainstream macroscopic aspects and a microstructural compositional approach, which incorporated: a) an initial systematic qualitative examination of the entire ceramic collection, including a re-fitting experiment and a complete taphonomic evaluation. This led to the identification of direct or physical joins and non-physical but highly probable matches; b) the selection among the highly probable but non-adjoining matches of sherd-pairs representing a suite of sherds types and taphonomic alterations, aimed at tackling a series of research questions, and c) the use of thin section petrographic examination and the digital image analysis of photomicrographs to verify the previous observations in qualitative mineralogical and quantitative textural terms.