# THE TWO SIDES OF THE GUADIANA: INLAYED POTTERY FROM THE 3RD MILLENNIUM BC ALONGSIDE THE GUADIANA RIVER (SPAIN AND PORTUGAL)

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***Abstract:*** *In this paper we study the technological choices referred to inlay processes by physico-chemical analysis (XRD, and FTIR) in order to explore collective technical identity patterns alongside the Guadiana River -i.e. raw material selection-, comparing the production technology chosen by two neighbouring settlement networks of Perdigões and Tierra de Barros (Our case study Perdigões and Tierra de Barros neighbouring settlement networks are facing one to another and are separated by the Guadiana River). As a result of the study of technical identity we can engage the result of these fashioning techniques with social boundaries.*

***Keywords:*** *Bell Beaker, Copper Age, Iberia, Bone inlayed pottery*

## INTRODUCTION

Traditionally little or no attention has been paid to Iberian 3rd millennium BC vessel inlays, and a great percentage of decorated vessels of a large variability of decorative motifs and themes are inlayed in Iberia from the Neolithic to the Bronze Age.

In the Iberian Peninsula most of the studies of inlayed pottery are constrained by a small sample that in many cases is not representative of the assemblage, and in other cases archaeologist assume that technical variability is so reduced that all inlayed pottery may have always been done with calcium carbonates, and it is true that before *Odriozola & Hurtado (2007)* no other than calcium carbonate was encountered as an inlay in Iberia.

Recently these inlays have awoken scholars' interest as the result of new discoveries and methodologies applied to their study, which include the proposals of production models and the estimation of firing temperatures of the vessels based on the physico-chemical transformations of the inlayed material (*Odriozola & Hurtado, 2007; Odriozola & Martínez-Blanes, 2007*).

Pottery technology, as many other technologies is a complex system of behaviours and techniques oriented according to human choices; where each technological process can be solved in different ways, as, for example, arbitrariness in the process of technical choice results in technical variability, *i.e.:* the choice of different raw materials for inlay production. Thus this technical variability can be defined as a *Technological Style* and therefore we can describe the combination of production practices that are used by a group to produce different goods as their *Technical System* (*Lemonnier1986*) or *Technical Identity*. The choice between different possible material alternatives reflect a complete interioried understanding of tradition or *Technical System*, that is usually transmitted through generations; and some aspects of these operational sequences are more stable than others to change, and in some cases they are surprisingly resistant to change (*Stark 1998*).

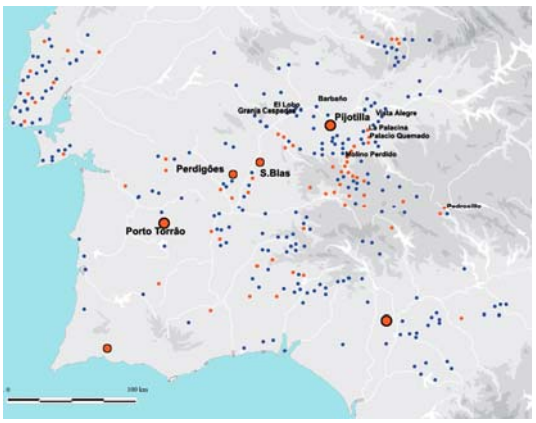


**Fig. 1** Southwest Iberia Copper Age settlement distribution (biggest dots are macro-territorial centres)

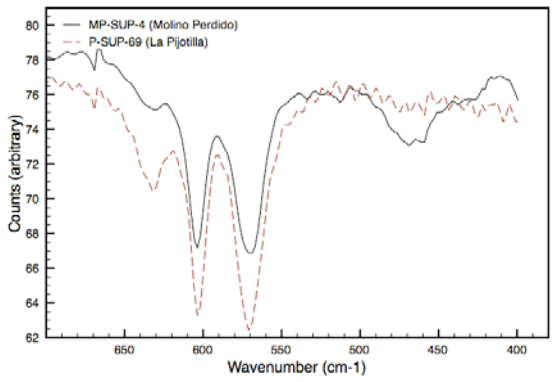


**Fig. 2** FTIR spectra on the interest region of bone inlayed pottery from Molino Perdido and La Pijotilla

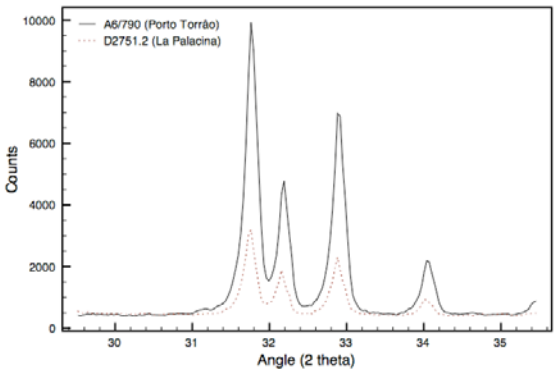


**Fig. 3** XRD diagram on the interest region of bone inlays of samples from Porto Torrão and La Palacina

In our case study the fact that the use of different raw material is not neutral implies completely different *Technical Styles*, based on raw material choice. Therefore if potters choose calcium carbonate the inlay process must occur after firing to avoid mineral decomposition during the fire, whereas if they choose bone, it is suitable for the inlay process is to be carried out prior to firing (*Odriozola & Hurtado 2007*), thus technical style in this case is not neutral, and it can be considered as a stable aspect of *chaîne opératoire* on the basis that if this aspect is changed the result may not be the desired one.

Pottery inlays variability is reduced to a limited number of known raw materials, *i.e.*: bone, calcium carbonates (limestone, shells) and kaolinite, which are the most popular for prehistoric Europe.

Focussing on the Iberian Peninsula the use of different raw materials to inlay vessels seems *a priori* to be geographically restricted, thus nowadays the use of calcium carbonate appears to be distributed in the Meseta Central, Meseta Norte, and Guadalquivir Valley, and the use of bone appears to be distributed in the Middle Guadiana River Basin suggesting a spatially delimited technical system.

Our goal is to picture in a broad sense the Middle Guadiana River Basin territory (*Hurtado 1995, 1999*) (**Fig. 1**) in terms of social boundaries based on inlay raw material technological choice, as this choice determines *Technical style* and characterises the inhabitants' *technical identity*.

## MATERIALS AND METHODS

44 samples from Copper Age continental style Bell Beaker pottery have been submitted for analysis. These samples correspond to the complete assemble of inlayed pottery recovered at 10 settlements: Barbaño, El Lobo, El Pedrosillo, Granja Céspedes, La Palacina, Palacio Quemado, San Blas, La Pijotilla, Perdigões and Porto Torrão.

Samples from Barbaño, El Lobo, El Pedrosillo, Granja Céspedes, La Palacina, Palacio Quemado, San Blas and La Pijotilla come from a geographically restricted territory, where socio-political hierarchy is articulated around the central place of La Pijotilla (*García Sanjuán & Hurtado 1997, Hurtado 1995, 1999*). In order to picture social boundaries of this so called Tierra de Barros Territory (*Hurtado 1995, 1999*) we have also sampled inlayed Bell Beaker pottery from the Portuguese bank of the river: Perdigões and Porto Torrão.

We have performed XRD and FTIR analyses to test what choice the potters were making in the Middle Guadiana Basin from the raw material mentioned above.

**Table 1** Detailed results of inlayed material analysis

| Site | # | Samples | Bone | CaCO3 | Other |
|---|---|---|---|---|---|
| Barbaño | | 5 | 2 | 0 | 3 |
| El | Lobo | 3 | 1 | 1 | 1 |
| El | Pedrosillo | 2 | 2 | 0 | 0 |
| Granja | Cespedes | 2 | 2 | 0 | 0 |
| La | Palacina | 5 | 4 | 1 | 0 |
| Palacio | Quemado | 2 | 2 | 0 | 0 |
| Perdigões | 4 | 4 | 0 | 0 | |
| Porto | Torrão | 1 | 1 | 0 | 0 |
| San | Blas | 16 | 16 | 0 | 0 |
| La | Pijotilla | 14 | 11 | 3 | 0 |
| | | 44 | 33 | 5 | 4 |
| | | 100% | 75% | 11,40% | 9,10% |

As a first stage FTIR spectra were collected as a test to ensure the possible bone nature of the samples as proposed by *C. Odriozola and V. Hurtado (2007)*. Thus FTIR spectra were collected from the bone-based inlays using a Nicolet 510P Fourier Transform infrared spectrometer with a DTGS detector.

Data was recorded in the transmission mode from pellets of the powdered samples dispersed in KBr, by co-adding 64 scans at 4 cm-1 resolution. The system was previously $N_2$ purged to reduce atmospheric $CO_2$ and $H_2O$ absorption.

For all the rest of the samples we have performed X-ray powder diffraction analysis with a Panalytical X'PertPro diffractometer with a theta-theta goniometer, using the following measurement conditions: 1/8º for divergence slit and 1/4º for antiscattering slit, with a copper anode at 40 kV and 40 mA (λ=1.5406 Å) equipped with a X'Celerator detector and a Kβ filter (Ni).

## RESULTS

The presence of the FTIR band at 630 cm-1 corresponding to hydroxyl librational mode, jointly with the X-ray diffractograms (hydroxyapatite: ICDD pdf 9-432) has ensured the bone nature of 33 of the 44 studied samples (*Odriozola & Hurtado 2007*). (**Figs. 2** and **3**)

5 samples were made with calcium carbonate and 4 were just earth that after cleaning the pottery sherds appeared to be an inlay but were not (**Table 1**).

Only in La Palacina and La Pijotilla we have recovered pottery sherds that were inlayed with calcium carbonate, while all the remaining samples were inlayed with bone. The percentage of calcium carbonate inlays in La Pijotilla and La Palacina are similar c. 22%.

## DISCUSSION

75% of the analysed samples were inlayed with bone, these samples come from a geographically restricted territory that show socio-political hierarchy articulated around the central place of La Pijotilla (*García Sanjuán & Hurtado 1997, Hurtado 1995, 1999*) and from the west bank of the Guadiana River.

These results suggest that the technological choice of bone as inlay is widespread at both banks of the Guadiana River and it is not geographically restricted to the Tierra de Barros territory as it was firstly thought. Although this choice characterises the Middle Guadiana River Basin technical system in opposition to other neighbouring technical systems in the northern and eastern regions such as Meseta Norte and Meseta Central, which are characterized by the choice of calcium carbonate.

Thus Middle Guadiana River Basin's *Technical Identity* is clearly defined by the use of bone as raw material for pottery inlay, although it has been observed that in a minor percentage (25%) other raw materials are used.

The appearance of raw materials other than calcium carbonate may reflect a long distance transaction with neighbouring territories; these long distance trade transactions have been long ago proposed by the Bell Beaker package (*Clarke 1976*) and recently studied for Middle Guadiana Basin (see *Odriozola et al. in this volume*). Likewise the appearance of calcium carbonate may reflect this long distance trade transaction between territories.

This long distance transaction is supported on the evidence that only La Pijotilla (central place) and a site on the oriental edge of the territory (La Palacina) have a few of this type of inlay.

## ACKNOWLEDGEMENTS

The authors acknowledge the Spanish Ministry of Education, Science and Sports (MAT2005-00790) and the GRICES-CSIC collaborative framework (2005PT0030) for the financial support. The corresponding author is especially grateful to the I3P pre-doctoral fellowship program.

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