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Bronze production in the Iron Age of the Iberian Peninsula: The case of *El Castru*, Vigaña (Asturias, NW Spain)

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ABSTRACT

Bronze production during the Iron Age of the Iberian Peninsula is characterised by the use of a relatively simple technology, based on crucible-furnaces. In an area rich in mineral resources, bronze was produced on a small scale and within settlements, to be used for ritual, ornamental and functional objects.
Here we present an analytical study of slagged crucibles, small slag nodules and casting spillage from the Iron Age hillfort of El Castru, in Vigaña (Asturias, NW Iberia), with a particular focus on the technology of bronze production. The study sought to contribute to our understanding of Pre-Roman metallurgical activities in the region, as a case in point to discuss broader prehistoric traditions of bronze-making.
The results show that the technology and scale of bronze production at this hillfort are coherent with the pattern described for much of prehistoric metallurgy in Iberia, with the -direct production of copper alloys by cementation and co-smelting of mineral ores. The results also illustrate some of the challenges encountered when attempting to identify metallurgical processes through the analyses of crucible residues, and propose some criteria to facilitate future studies.

1. Introduction

The Iberian Peninsula is characterised by the existence, and persistence well into the Iron Age, of a metallurgical technology based on the use of crucibles for the extraction of metals from their mineral ores (Rovira, 2006), in stark contrast with the furnace-based metallurgy that predominates in the later prehistory of the rest of Europe and the Near East. The present study is a contribution to further characterise the geographic and diachronic variability of this tradition. Non-ferrous metallurgical debris recovered in the Spanish Iron Age hillfort known as El Castru in Vigaña (Belmonte de Miranda, Asturias), were subjected to technical characterisation by means of optical microscopy and SEM-EDS analysis. A major focus of the research is the technology employed for the production of copper alloys. Focusing primarily on slagged crucibles, as well as small slag and metal pieces, we sought to characterise bronze-making technology at the site, and to contextualise our results more broadly in regional and archaeometallurgical studies concerning prehistoric bronze production. Using El Castru as a case in point, we also discuss the challenges associated to the identification of different bronze-making processes based on the analysis of crucibles, and provide some pointers for future research.

2. Excavations at El Castru in Vigaña

The Iron Age of NW Iberia (9th-1st century BC) is characterised by the predominance of monumentalised settlements known as *castros* (hillforts), which evidence the full sedentarisation of local communities in mountainous areas during this period. This site type gave rise to the culture-historical denomination of the *Castro Culture* as a rather uniform entity (i.e. Maluquer de Motes, 1975; Maya González, 1983). More recent research has revealed greater sociocultural diversity within the *Castro Culture* label than initially assumed (Marín Suárez, 2011a), leading to more regionalised approaches to the temporal and spatial variability of this phenomenon (González Ruibal, 2006, 2011; Marín Suárez, 2011b; Parcero Oubiña, 2003; Sastre, 2011).

In general terms, these groups are characterised by a production system governed by family groups. The control and exploitation of the territory was in the hands of the communities who lived within individual settlements providing goods for themselves; thus social communities were connected to a landscape in which they could be largely self-sufficient (Sastre, 2011). Iron Age material culture "has often been depicted as representing continuity" (González García et al., 2011). In the realm of copper metallurgy, this conservatism may be in part due to the

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geological characteristics of the territory, which offered extensive mineral resources to the local communities (Rovira, 2002), who took advantage of the cooper resources at least since the second half of the Third Millennium cal BC (de Blas Cortina and Suárez Fernández, 2010). Easy access to raw materials and a low cost/benefits ratio provided little incentive to innovate or optimise production methods.

The hillfort of El Castru is located near to the small village of Vigaña (Asturias, Spain). Among the diversity of Iron Age communities in NW Iberia, this small site is thought to have been inhabited by a small group of a few dozens of people, which would fit in what González Ruibal (2011) has defined as "deep rural communities" model. These groups had a sort of heterarchical model of social organisation, and the local community in every hillfort would play a central role in the political, productive and identitarian structures (González Álvarez, 2016; Marín Suárez, 2011b). El Castru was excavated during two campaigns, in 2012 and 2013, by archaeologists of the University of León and the University Complutense of Madrid. The hillfort is located on the top of a small limestone outcrop over the valley of the Pigüeña River (Fig. 1). Excavations concentrated on two distinct areas of the hillfort, covering a total extension of 72 m^2. A first 3×4 m trench was excavated in one of the terraces on the western hillside, outside the walled perimeter of the site. A second excavation took place at the top of the hill, where archaeologists aimed to find dwellings and evidence of domestic activities. The excavation of a 6×10 m trench revealed the presence of domestic units and structures associated to metallurgical operations (Figs. 2 and 3) (González Álvarez, 2016), which will be explored in detail in this paper.

The stratigraphic sequence in El Castru was organised in six phases, the earliest of which dates to the Early Iron Age. The levels with metallurgical remains were dated to the Late Iron Age by means of ceramic typology and radiocarbon dating. Two radiocarbon dates were obtained, which yielded 2-sigma calibrated ranges of 359–108 cal BC (DSH5058, charcoal) and 403–120 cal BC (Fi2985, bone), respectively (Fernández Mier and González Álvarez, 2013; González Álvarez, 2016).

The identification of pits with a fill rich in clay and charcoal fragments, along with crucibles, a few slag fragments and bronze scraps indicates that metallurgical activities were carried out within the settlement. At least two associated round structures (Cu-1 and Cu-2 in Fig. 2), made of yellow clay tempered with pebbles and occasional bone fragments, showed evidence of intense heat impact. The two structures belong to the same phase and were tentatively interpreted as some heating installation associated to metalwork. The majority of the material analysed in this study comes from the installation labelled Cu-1 (Fig. 2). At the centre of the structure, underneath the clay lining, the excavation revealed a platform made of medium-sized stones, seemingly intentionally placed (Fig. 3). This metallurgical area would be later dismantled by the construction of two roundhouses during the phase 4 of the archaeological sequence. In fact, the perimeter ditch for the foundation of hut C-1 partially affected the conservation of the metallurgical structure Cu-1.

The characteristics of the pits found next to the enclosing walls, as well as the other metallurgical materials recovered, resemble those found in Late Iron Age levels in the nearby hillforts of La Campa Torres (Maya González and Cuesta Toribio, 2001), Llagú (Berrocal-Rangel et al., 2002) and El Chao Samartín (Villa Valdés, 2005), also in Asturias (see Fig. 1).

An interesting characteristic observed in Asturian *castros*, and which seems typical of the Iron Age in NW Iberia, is that the metallurgy of copper and iron was carried out in the same workshop and, possibly, by the same artisans (Fernández-Posse et al., 1993; Rovira and Gómez Ramos, 2001; Fanjul Peraza and Marín Suárez, 2006). In El Castru, fragments of iron objects were recovered alongside the crucible remains (González Álvarez, 2016). It is not known however, whether iron was produced at the site or brought from other *castros*. Iron appears in NW Iberian hillforts during the first half of the first millennium BC, in a context characterised by the continuity of metallurgical techniques employed for the production of bronze (Camino Mayor and Villa Valdés, 2014). Ferrous metallurgical remains and possible iron smelting furnaces have been found in many Asturian *castros*, such as La Campa Torres (Rovira and Gómez Ramos, 2001), Llagú (Berrocal-Rangel et al., 2002) and San Chuis (Jordá Pardo et al., 2011), and other sites in the broader region such as La Corona de Corporales and El Castrelín de Paluezas in León (Fernández-Posse et al., 1993) or Santa Comba in Galicia (González Fernández, 2002). The evidence from these sites suggests that different technologies and scales of productions may have coexisted, possibly also within the same settlements.

With the introduction of iron, weapons and tools started to be produced with the "new" metal, while it seems that bronze acquired a new importance in the manufacture of jewellery, adornments, etc. This is confirmed both by the new type of objects introduced at the end of the Bronze Age and beginning of the Iron Age (fibulae, sheets,

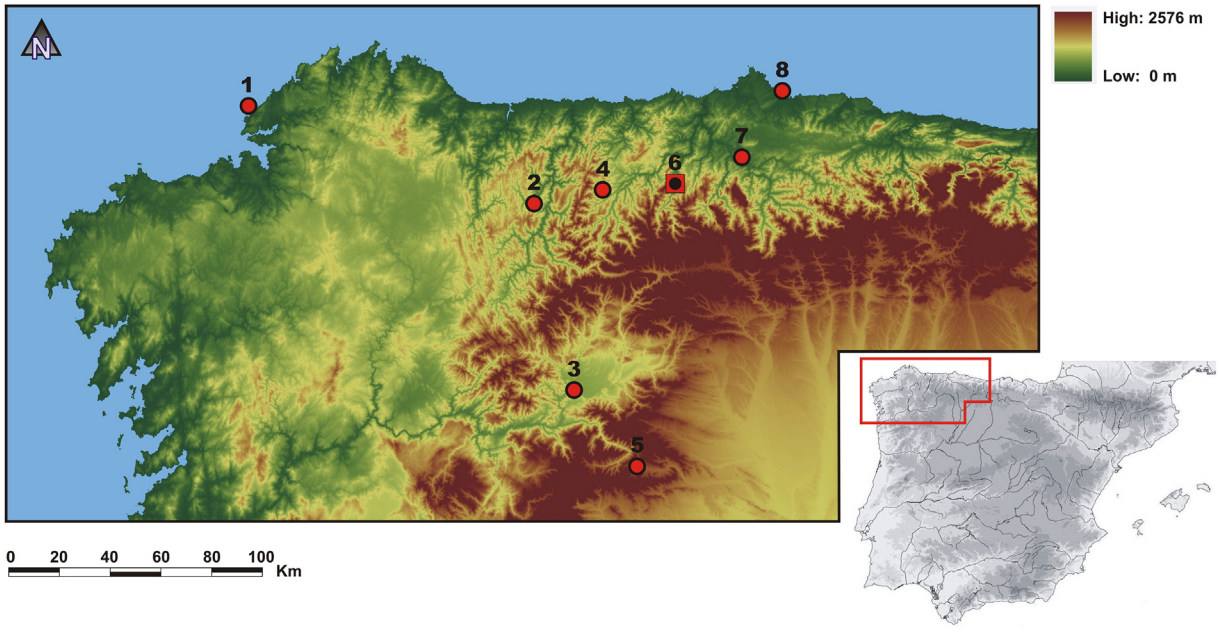

Fig. 1. Map of the Iberian Peninsula showing the location of the village of Vigaña, and including the distribution of sites where the use of smelting crucibles during the Iron Age has been reported. 1. Medellín (Badajoz), 2. Campa Torres (Gijón, Asturias), 3. Castrelín, El (San Juan de Pazuelas, León), 4. Castro de Barahones (Valdegama, Palencia), 5. Castro de Hinojo (Caserío de Hinojo, León), 6. Castro de Pedrero (Las Médulas, León), 7. Corona de Corporales, La (Truchas, León), 8. Illa d'en Reixac (Ullstret, Gerona). (Adapted from Gómez Ramos, 1999, 178:29).