

# ARCHAEOMETRIC STUDY OF THE METALLIC ARTEFACTS FROM A RICH LATE ROMAN TOMB AT TORREJÓN DE VELASCO (MADRID, SPAIN).

GARCÍA-VUELTA, O. ; PEREA, A.; CUESTA, F. ; GENER, M.; MONTERO, I. ; MURILLO, M. ; RENZI, M. (\*)



The site of "Camino de Seseña" (Torrejón de Velasco, 26 Km S. of Madrid), was excavated between September 2006 and February 2008 by R. Flores and P. Sanabria. A Roman Imperial *villa* was documented, as well as other structures such as a Late Roman tomb (4th/5th centuries AD), a *unicum* in the Iberian Peninsula for its features and funerary remains.

Location of the site



## The tomb

It consists in a rectangular pit (2,4 x 0,8 m, 1,5 m deep). Although a rich set of grave goods was found, including weapons, ritual and sumptuary objects, human remains were not documented. The grave goods were found at the bottom of the pit and in a side niche at the eastern wall of the tomb.

## The Grave Goods

- (Pit) **Bronze**: a *situla*, a brazier, two belt fittings with rivets; **Iron**: a ladle, a small awl, a knife, a spearhead, a sword and some unrecognizable fragments; **Silver**: three buckles and a possible sword amulet with ivory; **Gold**: one buckle.
- (Niche): **Pottery**: a *Terra Sigillata* plate; **Glass**: a bottle and a bowl; **Silver**: a spoon and a bowl; **Bones**: an incomplete small bird.

All the objects are kept in the *Museo Arqueológico Regional* (Alcalá de Henares, Madrid).



Up: grave goods in the niche of the tomb: glass bottle, glass bowl, spoon (Tv9) silver bowl (Tv4) on a TS pottery plate.

Left: some grave goods in their original position: 1. Iron sword, 2. Silver and possibly ivory amulet (Tv8), 3. Gold buckle (Tv12), 4. Silver buckle (Tv11), 5. Bronze belt fittings (Tv12 and Tv13), 6. Iron indet. artefact. Photo.: Sanabria & Flores.

## Archaeometric research

A preliminary research via SEM-EDS of the non-ferrous metallic materials of the tomb was carried out at the *Laboratorio de Microscopía Electrónica y Microanálisis (Microlab)* at the CCHS-CSIC (Madrid, Spain). The poster presents preliminary results of a broader study still in progress.



SEM Hitachi S400n and Bruker Xflash 4010 detector used in the study. Photo.: G-Vuelta

## Equipment

- **SEM**: Analytical Variable Pressure Hitachi 3400N-II with SE & BSE detectors. SEM resolution: 3 nm-30 Kv (HV); 10 nm-3 Kv (HV); 4 nm-30 Kv (LV).
- **EDS**:
  - \* Bruker Quantax 200 Xflash 4010 detector. Ultra-thin window (Silicon drift detector SDD). Active area: 10 mm<sup>2</sup>. Lineal Resolution: 133 e V (or > in 1-10.000 cps range).
  - \* Bruker SVE III Xflash Analytical signal processing unit.
- **Software**: Bruker Quantax Sprit v. 2.1

## Working Conditions

- The objects under analysis were placed directly in the SEM chamber after mechanical removal of a small area of the corrosion layer. Sampled metallic flakes were used to analyse objects bigger than the SEM chamber.
- High vacuum, Secondary Electrons Detector.
- Results to the standard weight %, are the average of three analyses for each sample (300x window).
- Only elements over 1% are quantified. 'Det' is indicated for elements identified in the spectrum under the detection limit of the SEM-EDS.

## Analysed objects

- **Bronze**: 1 *situla*, 1 brazier, 2 belt/weapon fittings with rivets (Tv12 and Tv13).
- **Silver**: 1 bowl (Tv4), 1 spoon (Tv9), 3 buckles (Tv9, 10, 15), and a fragment (Tv17); 1 possible sword amulet, with ivory (Tv8).
- **Gold**: 1 buckle (Tv12).

## Copper-Based Alloys

It is striking that each object was made using different alloys: a tin bronze rivet, a leaded bronze cauldron, a brass brazier with high lead and tin impurities, and belt fittings of mixed alloys (gunmetal or leaded gunmetal). It must be highlighted that the rivet and the plates of two belt fittings were also made from different alloys. Predominance of mixed alloys is characteristic of Late Roman metallurgy.

| OBJECT               | SEM   | Inventory | Cu   | Zn   | Sn  | Pb   |
|----------------------|-------|-----------|------|------|-----|------|
| Situla               |       | 5093-1    | 87,0 |      | 6,1 | 7,2  |
| Brazier              |       | 5039      | 73,0 | 21,1 | 2,8 | 3,0  |
| Belt Fitting         | Tv12a | 50395-12  | 78,4 | 3,6  | 7,2 | 9,9  |
| Belt Fitting (rivet) | Tv12b | 50395-12  | 90,9 |      | 9,1 | Det. |
| Belt Fitting         | Tv13  | 50395-13  | 87,3 | 4,3  | 8,3 |      |



Up: brass brazier. Inv: 5039 (Max. Diam.: 39 cm.; H: 11,5 cm). Bottom: leaded bronze *situla*. Inv: 5093-1 (Max. Diam.: 37,5 cm. ; H: 22,5 cm. cm.). Photo.: Sanabria & Flores.

Up: belt fitting Tv13. Bottom: belt fitting and rivets Tv12. Photo.: G-Vuelta.

Up: Tv13. Analysed Surface (polished) (SE x30). Bottom: Tv12. Rivet (polished)

## RESULTS

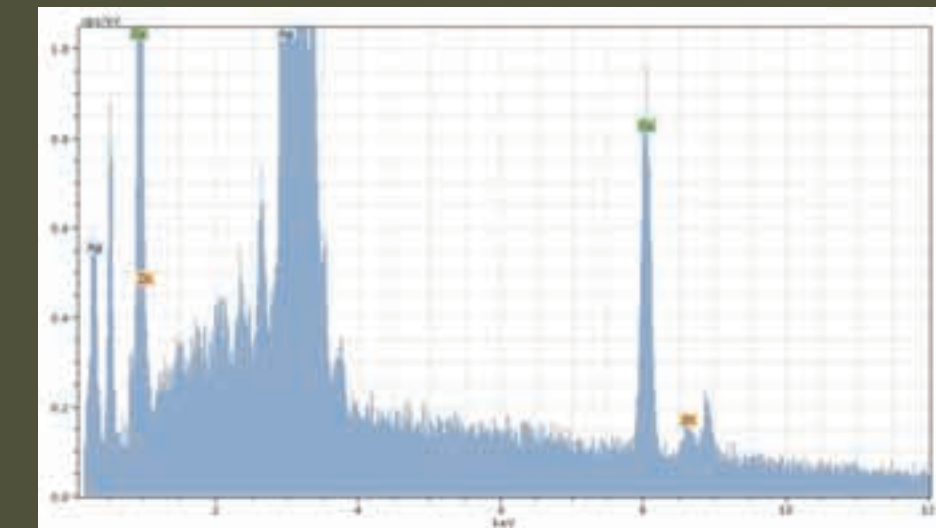
### Gold and Silver Alloys

Silver of variable purity was employed, although high-purity silver (>95%) is predominant, as is usual in the period. Except for an almost pure-silver buckle (Tv10), all the objects have copper contents in different proportions. Two silver items alloyed with brass stand out. This is confirmed by the presence of Zn. Cu/Zn ratio oscillates between 84/16 - 90/10. This is the earliest silver-brass alloy identified in the Iberian Peninsula so far, although it is documented since the 2<sup>nd</sup> century AD in other areas of the Roman Empire. Lead and gold impurities have also been detected in some objects.

| OBJECT             | SEM  | Inventory | Ag   | Cu   | Au   | Zn   | Pb   |
|--------------------|------|-----------|------|------|------|------|------|
| Bowl               | Tv4  | 50393-4   | 93,3 | 6,6  | Det. |      |      |
| Spoon              | Tv5  | 50393-5   | 92,4 | 7,5  |      |      |      |
| Sword Pommel       | Tv8  | 50395-8   | 79,3 | 18,6 |      | 2,06 |      |
| Big Buckle (prong) | Tv9  | 50395-9   | 95,6 | 4,4  |      |      | Det. |
| Big Buckle (body)  | Tv9  | 50395-9   | 95,3 | 4,7  |      |      | Det. |
| Buckle (prong)     | Tv10 | 50395-10  | 96,3 | 3,7  |      |      |      |
| Buckle (body)      | Tv10 | 50395-10  | 99,0 | Det. | Det. |      |      |
| Buckle (prong)     | Tv11 | 50395-11  | 1,5  | nd   | 98,5 |      |      |
| Buckle (body)      | Tv11 | 50395-11  | 1,7  | nd   | 98,3 |      |      |
| Buckle (body)      | Tv15 | 50395-15  | 95,7 | 4,3  |      |      |      |
| Buckle (prong)     | Tv17 | 50395-17  | 90,3 | 8,2  |      | 1,55 |      |



Silver Bowl Tv4 (Max. Diam: 14,6 cm.; Max. Height: 6,2 cm.) Photo.: Sanabria&Flores



Spectrum of the Tv8 sample with Zn. Silver-brass alloy with a Cu/Zn ratio of 84/16



1. Silver Spoon Tv5; 2. Stamped motives (Obv.). 3. Wear marks on the surface (Rev.) Photo.: G-Vuelta.



Possible sword amulet Tv8. Right: micrograph of the bone/ivory body and the analyzed central silver ring (polished) Photo: G-Vuelta

The gold belt buckle (Tv11) stands out for the purity of its gold. Topographic examination of the surface with SEM shows wear and working traces, both in the gold (Tv11) and silver buckles (Tv9).



Left: wear traces at the inner face of the Tv9 buckle body. Photo.:G-Vuelta.

Gold buckle Tv11. Left: plastic deformation working traces. Photo.: G-Vuelta