# 16<sup>th</sup> century azulejos - what lies beneath the ground of Lisbon?

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SUMMARY: In the Vila Viçosa Palace, in the southern Portuguese province of Alentejo, lie the still impressive remains of what was the most extensive commission of azulejos produced in Antwerp for Portugal. In an inventory made in 1563 after the death of the 5<sup>th</sup> Duke of Braganza D. Teodósio, it was documented that no less than 3,658 azulejos commissioned to Antwerp had been delivered up to that year. Until recently there was no known parallel between the pieces commissioned to Antwerp for the Palace of Vila Viçosa and other commissions for Portugal. At an excavation in Lisbon, in the area of the Escolas Gerais five azulejos and two fragments, also of Flemish production, were found in what is thought to be a rubbish tip because they were part of the frame of a panel of which nothing more was found. Other excavations in Lisbon, namely near Casa dos Bicos, Largo do Corpo Santo, Largo do Carmo, Palácio dos Condes de Penafiel and the grounds of the former Igreja de Santo André in Graça produced more fragments of 16<sup>th</sup> century azulejos of varying provenance giving us a glimpse of an unexpected wealth of types and decorations used in the Lisbon of the 2<sup>nd</sup> half of the 16<sup>th</sup> century at a time when a local production of faience azulejos was just starting. Now other pieces are now appearing in different archaeological contexts giving testimony of a discrete but nevertheless clear trend that needs to be acknowledged. The presence of these remains points to the spread of an appreciation for faience tiles and may well be evidence of the foundation for the Portuguese taste for azulejos that has lasted to this day. This communication reviews some of the findings supported by scanning electron microscopy observations and analysis which have tried to integrate some of these cases into known provenances or types.

*KEY-WORDS: Renaissance majolica; Faience tiles from Antwerp; Use of instrumental means in the study of majolica* 

### INTRODUCTION

For many years when there was a reference to the presence of Flemish 16<sup>th</sup> century azulejos in Portugal the what immediately came to mind were those commissioned by the 5<sup>th</sup> Duke of Braganza, D. Teodósio (c.1510-1563) for his splendid Palace of Vila Viçosa, in the southern province of Alentejo. This Medici-like prince placed an order from Antwerp of what was at the time a prodigious amount of faience azulejos, probably related to the fact that he was preparing the celebration of his marriage in 1559 with Beatriz of Lencastre. We now have a very clear image of this prince and his palace following an important research project funded by FCT (the Portuguese Foundation for Science and Technology), of the inventory of his possessions that was made after his death [1]. Regarding the azulejos we know their number: 3.658, of which ca. 900 still exist today. A study conducted in 2012 enabled us to better understand the motives and intentions reflected in these different sets of panels [2].

Regarding the commencement of the production of faience azulejos in Lisbon, what interests us the most is the date when these Antwerp products arrived in Portugal. The presence of the date "1558", in two azulejos belonging to different sets is an interesting element because at that time the Flemish artists working in Spain were painting azulejo panels in the same style. These include Frans Andries in the Cathedral of Toledo (1558) and Hans Floris in the Church of Garrovillas (1559), not far from the Portuguese border. We also know that around 1554 a then 18-year old Flemish man named Hans Goos, known in Portugal as *João de Góis*, had arrived in Lisbon and six years later would be known as a "oleiro de málaga e azulejos" (potter of faience and azulejos) or "potter of azulejos" [3].

An interesting fact about the azulejo commission of D. Teodósio is the fact that, although it was very well connected with the European renaissance style of its time, it was disconnected from the continued Lisbon taste for Hispano-Moresque azulejos that had been in fashion in Portugal since they were introduced from Seville in the late 15<sup>th</sup> century. Until recently it was thought that there some production of faience azulejos in Lisbon by the late 1560s and during the following decade and only scarce examples of what have presumed to be Flemish patterned pieces, which are mainly attributed to the last quarter of the 16<sup>th</sup> century. However, recent archaeological excavations in Lisbon seem to give a different picture. In 2012, while excavating in a Lisbon area called "Escolas Gerais", three archaeologists (Inês Castanheira, Inês Ribeiro and Raquel Policarpo) uncovered five azulejos and two fragments of an exceptional panel of Flemish origin [4]. The excavated site was thought to be a rubbish tip and not the original placement site of the pieces preventing any association of the tiles to a specific building. However, it is an area of special significance because this was the quarter of the ancient university centre of Lisbon, which was established in buildings originally made available by none other than Prince Henry (Infante D.Henrique, also known as The Navigator). This explains the name Escolas Gerais, an ancient designation for universities where many subjects were taught. The University was moved to Coimbra in 1537 after which the area was continually renovated at a time when the aesthetics of the Renaissance would have been suited to faience azulejos panels made in Flanders. The elements that have been discovered show the motifs painted against an orange background which seems to be an unusual choice for Flanders tiles [5] although we also see this in the surviving panels ordered for Vila Viçosa.

In the tiles found in the *Escolas Gerais* area we see garlands of vegetation and fruits with birds and a snake composing part of what may have been an encircling decoration. Also two *putti* playing flutes, where the lower side of the bodies end in acanthus leaves. Two azulejos represent a fantastic bird surmounting what seems to be a frame of probably a heraldic motif that unfortunately was not preserved (figure 1). All the pieces belonged to the same panel and due to the positioning numbers on their backs we know that they were composed by 60 azulejos. Until now the azulejos in the Vila Viçosa Palace were considered, even by local standards, to be amongst the three most important works painted in the workshops of Antwerp. However, the group uncovered at Escolas Gerais is also of exceptional quality, arguably even surpassing those commissioned by D. Teodósio seen in the way the painting shows a remarkable mastery in the use of colour and the definition of volume and light. Contrary to the Vila Viçosa ensemble, this seems to have been a single panel, probably depicting the coat of arms of the purchaser at its centre, or some other motif that illustrated a specific purpose.



Figure 1a, b, c, d, e, f, g (clockwise left to right): Azulejos and fragments found during an archaeological excavation in Lisbon, in the area of the old *Escolas Gerais*.

Since 2016, excavations in four other sites uncovered more testimonies of the presence of faience azulejos of undetermined origin in Lisbon datable to the second half of the 16<sup>th</sup> century. One excavation, under the responsibility of archaeologist António Valongo, was in the so-called area of *Largo do Corpo Santo*, near the *Arsenal da Marinha* in Lisbon, once on the bank of the river, from which it is now separated by an embankment, not far from the Royal Palace destroyed by the earthquake of 1755. The findings, once again in the context of a wastetip, stem from an area where, in the 16<sup>th</sup> century, the most remarkable building was the celebrated palace of the Corte-Real family, built in 1585. At that time in this area there was also a small chapel dedicated to *Nossa Senhora da Graça* which has today disappeared. Being found in a disposal context, it is difficult to pinpoint which building the azulejo finds belonged to, or even whether they all originate from the same place.

Among an impressive array of Italian and Spanish ceramics from the 16<sup>th</sup> century the archaeologists uncovered several groups of Hispano-Moresque azulejos some of which were only previously known from the Royal Palace of Sintra (figure 2a) and believed to have been a commission expressly made to be applied there. Among other unusual, and in some cases almost unique, pieces there were three fragments of faience azulejos that, although they could be associated to a Flemish origin, may have been produced in Seville or Lisbon (figure 2b, c, d).

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Figure 2a, b, c, d (left to right): Azulejo fragments found during an archaeological excavation in the area of Largo do Corpo Santo in Lisbon. 2a) fragment of a so-called "Parra" tile known to have being commissioned for the Palace of Sintra; 2b) fragment of a patterned azulejo, ca.1560s (?); 2c) fragment of the frame for a panel and 2d) fragment of the framing of an ornamental or heraldic motive (1560s to 1580s?)

One of the pieces (figure 2b) is a fragment of a patterned azulejo that depicted an elaborate composition in blue over the white background of a stylized arabesque surmounting a cross. These motives in blue are related to the compositions that could be seen in embroidery and lace and were popular in Italy (where they seemingly originated) Flanders and Spain. The second fragment (figure 2c) is related to a frame, which in Portugal we call a "cercadura", its width spanning a single azulejo. This kind of motif has been classified by some authors as being of Moresque taste, reflecting the famed Moorish metalwork. The last fragment may have been part of a composition that framed an ornamental or heraldic motif, hinted by the round element in orange of which a part is discernible and that was commonly used in the composition of portraits or other important decorative elements. From the set found in this excavation this one, albeit rather naively painted, is undoubtedly the most exquisite in terms of the quality of the pigments and the composition depicted, creating a subtle but effective alignment of decorative elements suitable to frame an important central component.

The third site in Lisbon, on an embankment, was excavated by a group whose leading archaeologist was Claudia Manso. It was again near the river but this time on the other side of the grounds at Campo das Cebolas where the Royal Palace once stood. Among an astonishing collection of Italian maiolica and Spanish pieces of this period, an important set of azulejos was found, some of them being very unusual (figure 3). Once again, a fragment was found of a type of Hispano-Moresque azulejo only previously known to have been commissioned for the Royal Palace of Sintra, although it had a different aesthetic than the one that appeared in the previously mentioned excavation. Another azulejo found there, was an example of an early piece of faience azulejo, this one being what in Portugal is called a "friso", a frame whose width is that of half an azulejo or less. Depicting a "laçaria" motive or a twist string related with the Moresque aesthetic, it is of a rather different composition from what usually is associated with Flemish workshops which rooted their designs solely on the renaissance taste. Despite being less perfect in terms of the quality of the drawing, the design is nevertheless difficult to render in the faience technique and the colours are vibrant and attractive.



Figure 3 a, b, c (left to right): Azulejo fragments found during an archaeological excavation in the grounds of the area of *Campo das Cebolas* in Lisbon. 3a) a fragment of a *cuerda seca* Hispano-Moresque tile with a pattern called "pé de galo" known previously only from the Palace of Sintra; 3 b) fragment of a faience *laçaria* narrow frame for a panel, ca.1560-1580; 3 c) floral painting on an azulejo remarkable for the reddish biscuit, a colour often seen in the earliest faience azulejos produced in Lisbon.

The area where the pieces were found is of significance. Near this area stands to this day the famous *Casa dos Bicos* ou *Casa dos Diamantes* ("House of Beaks" or "House of Diamonds") an Italian-like building that was erected by Brás de Albuquerque, son of Afonso de Albuquerque, the Viceroy who laid the foundations of the Portuguese "India State". This is an interesting aspect because the same Brás de Albuquerque was responsible for the *Quinta da Bacalhoa*, in Azeitão, a place that is related to very early faience azulejos attributed to the Lisbon workshops [6]. When the remains of his father were brought back from India, they were laid to rest in a mausoleum in the main chapel of *Igreja da Graça*, in Lisbon [7]. In an area of that same church the azulejos signed by João de Góis are set, possibly the earliest tiles known from this time that we can claim to have been made in Lisbon in the faience technique. Although the archeological finds cannot be associated with Brás de Albuquerque, it is certain that he had a taste for faience tiles painted in the renaissance style and his name recurs in the area of the finds in 16<sup>th</sup> century Italian majolica and azulejos.

Finally, on another archaeological excavation in 2018, led by archaeologist Victor Filipe at a building in *Travessa do Açougue*, where it is still possible to see the remains of the main chapel of the demolished *Igreja de Santo André*, several elements of the building were discovered. Amongst the finds were part of a ceramic floor and six fragments of majolica azulejos, five of which, seemingly from a historiated panel are illustrated in figure 4. A hypothesis is that some of these fragments are the remainders of a now-lost azulejo panel known to have existed in the same church and dated to ca. 1580 [8]. The historic significance of this find will be discussed in a separate paper [9].



Figure 4a, b, c, d, e, f (left to right): Azulejo fragments found during an archaeological excavation in the grounds of the demolished Igreja de Santo André. 4a) to 4e) are thought to have been part of an azulejo panel dated ca. 1580 known to have existed in the church. 4f) does not depict the same blue contours and therefore may have belonged to a different panel.



### **INSTRUMENTAL MEANS**

The fragments were sampled by removing small fractions of the glaze with biscuit attached which were embedded in resin and polished for observation and analysis by scanning-electron microscopy coupled with energy-dispersive spectrometry (SEM-EDS).

SEM-EDS observations and analyses were made at the HERCULES Laboratory in Évora using a HITACHI 3700N SEM coupled to a BRUKER XFlash 5010 EDS. The specimens were uncoated and observations were made in back-scattering mode (BSE) with air in the chamber at a pressure of 40Pa and at an accelerating voltage of 20.0 kV.

The back-scattering mode relies on electrons from the incident beam that are back-scattered out of the specimen without losing their initial energy. Since heavy elements (those with higher atomic numbers in the Periodic Table) backscatter more electrons than light elements (those with low atomic numbers), areas with more heavy elements in their content appear brighter (or "whiter") in a back-scattered image and thus give information about the composition of the specimen under observation. As the glaze of an azulejo has a high lead-content, its image is much whiter than the image of the biscuit that contains mostly low-atomic weight elements such as silicon, potassium, and calcium. BSE imaging is therefore and ideal technique to study the glaze and its inclusions as well as the interface between the glaze and the biscuit.

### INSTRUMENTAL RESULTS

#### Flemish sample from the excavation at Escolas Gerais

Tile "boy and snake tile" (figure 1b) was sampled in the off-white area and the item obtained identified as "Az030/A1w". Figure 5 depicts its section after polishing, both in optical microscopy and as a BSE-SEM image.



Figure 5: Item Az030/A1w sampled from an excavated 16<sup>th</sup> century Flemish tile under the optical microscope and the SEM in BSE mode (same scale)

Before the presentation of results and discussion are undertaken, we need to understand that while macroscopically the tile looks presentable, even as a museum item, the consequences of a long burial in an environment with circulation of water can seriously affect it at the microscopic scale and influence relevant information such as the Pb content (lead can easily be lixiviated). Although the style of the decoration leaves little doubt that it is of Flemish origin, there remains the question of whether the workshop that produced this panel is the same that produced the tiles for the Vila Viçosa Palace [10]. We shall try to reply to that question by comparing the excavated tile with item Az031/A, sampled from a fragment of a Vila Viçosa tile shown in figure 6a.

As can be seen, the biscuit in figure 6b is of a homogeneous cream colour and the glaze in figure 6c is clear. In the sample under study the glaze is clouded by lixiviation and/or deposition of acquired chemical species, often alien to the tile, that darken the biscuit and make it less suitable for comparison purposes.

Figure 7 shows a SEM-BSE detail of the glaze of Az030/A1w. The top of the glaze is not perfectly flat because the glaze is flaking off but still its condition is acceptable. Excessive flaking of the surface is a direct clue that the decay has maybe advanced too far. The gas bubbles are not coated in the interior with a white layer- a good sign because when lixiviation attains the bubble area, part of the lead will deposit inside the bubbles and in BSE mode those deposits are seen as a very white lining. Therefore, this particular section Az030/A1w may be analysed with some confidence in the results.



Figure 6 a, b, c (clockwork from left): A fragment from a 1558 Flemish tile from the Vila Viçosa Palace that did not suffer burial and has been preserved in good condition. 6b) optical image of the section of a specimen sampled from the tile and identified as "Az031/A". 6c) BSE image of part of this section.





Figure 7: Part of the section of item Az030/A1w. There is only limited flaking of the surface and there are glaze areas suitable for semi-quantification

Figure 8 compares, at the same scale, the interface of Az030/A1w from the excavated tile with Az031/A from Vila Viçosa. This interface is important because its morphology is related with e.g. the duration of the firing cycle. Az030/A1w shows more interfacial crystalline growth than Az031/A suggesting that it may have been fired for a longer period, giving time for the growth of the crystals.



Figure 8a, b: Comparison of the interface glaze/biscuit on Az030/A1w (left) with Az031/A

We now turn to an analytical procedure (EDS) to try and compare the composition of the glazes. Figure 9 depicts two glaze areas of Az030/A1w that were analysed and the resulting spectra (taking spectra as fingerprints allows for a simple but quite effective morphological comparison of the results). The first spectrum identifies the relevant peaks and the second, of an area far apart, is compatible with the first in relation to those elements. If the specimen was too decayed for analysis, the top area would be expected to return different results, e.g. much lower contents in lead, than the area closer to the biscuit.

Figure 10 depicts the area and spectrum of a similar analysis on the Vila Viçosa specimen (Az031/A). It is clear that both tiles are quite different in a composition that may characterize the workshop, because the raw materials for the glaze should be acquired, prepared and mixed according to an in-house own recipe.

The comparison can also be based on the results of the semi-quantification (Table 1) and it is clear that the tile from the excavation has more sodium in the glaze (which might actually be a result of the long burial) but much less aluminium and potassium while the very important ratio Si/Pb, which defines the temperature at which the tiles may be fired, is considerably lower for Az030/A1w than for Az031/A. The burial would tend to lower the content in lead and therefore increase the ratio, not lower it.

This result, advanced as a working hypothesis, is consistent enough to suggest that the tiles excavated originated from a different workshop than those in Vila Viçosa. This is a conclusion of great importance to the technical history of majolica production in Antwerp that may later be strengthened when more instrumental results become available following further study.







Figure 9 a1, a2, b1, b2 (top to bottom): Two areas in the glaze of Az30/A1w selected for analysis and respective EDS spectra (a2, b2).



Figure 10: Area of the glaze of Az031/A analysed for comparison purposes, and resulting spectrum.

Table 1: Semi-quantification of the glaze composition in areas of Az30/A1w
(see figure 9b1) on the left side of the table and Az031/A (see figure 10)- all
values are % wt of the elements

Oxygen 31,12   Sodium 1,88   Magnesium 0,78   Aluminium 0,87
Sodium 1,88   Magnesium 0,78   Aluminium 0,87
Magnesium 0,78 Aluminium 0,87
Aluminium 0,87
Silicon 18,90
Potassium 3,30
Calcium 3,14
Iron 0,75
Tin 7,42
Lead 31,37
Si/Pb 0.60

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### Faience tile from an excavation near Largo do Corpo Santo

The tile shown in figure 2d was sampled and the items obtained identified as Az319. One of them, sampled from the yellow-coloured area, was identified as Az319/02 and a synopsis of the results will be given here.

Figure 11 shows the section of the specimen and, from the BSE image in figure 11b, its condition seems better than that of the Flemish tile discussed in the previous section. However the surface of the glaze, which should be flat, is chipped along its whole length showing that, although not visible to the naked eye, the surface of the glaze is missing almost entirely (figure 12a).



Figure 11a, b (top to bottom): Full section of test item Az319/02 under the optical microscope and the SEM in BSE mode.

Figures 12a) and 12b) show details of the glaze under the SEM in BSE mode. The white specks on 12a) are particles of the yellow pigment used.





Figure 12a, b (left to right): 12a) Surface of the glaze of specimen Az319/02. 12b) interface between the glaze and the biscuit.

	Oxygen	31,14
	Sodium	1,43
	Magnesium	0,83
	Aluminium	2,32
· State 1	Silicon	19,79
a with a second s	Potassium	2,35
and the second of the second	Calcium	1,23
"A state of the second s	Iron	0,79
	Zinc	1,08
	Tin	0,74
40 μm	Lead	38,32
NV WD- 10:0 mini		
	Oxygen	18,88
	Sodium	0,43
a s	Magnesium	0,51
	Aluminium	0,63
	Silicon	5,84
The second second	Calcium	1,92
The states	Iron	0,66
has the second s	Zinc	1,08
	Tin	5,98
	Antimony	19,06
SE MAG: 700 x HV 20.0 kV VD- 18:0 mm	Lead	45,02

Figure 13 a, b (top to bottom): 13 a) semi-quantitative analysis of the glaze in the section area bearing the grains of pigment. 13b) point semi-quantitative analysis of a yellow grain.

A semi-quantitative analysis of a grain of the light yellow pigment was performed and compared to a similar analysis of the matrix glaze (figure 13- all results are %wt of the elements) showing that the grain has a composition where, despite its incorporation into the glaze matrix, can be recognized as antimony (Sb) and a higher percentage of lead, tin and calcium. This result strongly suggests that the pigment was not the common Pb+Sb Naples yellow but rather a triple Pb+Sb+Sn pigment [11, pps.180-211] to which there is always an associated calcium content. This pigment was also found in the Vila Viçosa tiles [10]. This in no way means that the tile is Flemish since the pigment was imported to Portugal, at least to Lisbon, and has been found in tiles manufactured here, such as the panels of *Igreja da Graça* (to be published). Trying to identify a match between this tile and tiles excavated from different sites, we compared it to the discreetly decorated fragment excavated from *Igreja de Santo André* and depicted in figure 4f. Figure 14 shows that there is a close match in the glazes spectra (these may be compared with the spectra in figures 9 and 10 to see how different they are) suggesting that both fragments may indeed stem from a single workshop or, at least, from the same region, likely Lisbon.

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Figure 14a, b (from top to bottom): Comparison of the elemental spectra of the glazes of Az319/02 (the present tile on top) vs. Az 331/06 (a specimen sampled from the tile fragment excavated from far away Igreja de Santo André and depicted in figure 4f).

### CONCLUDING REMARKS AND HOPE FOR THE FUTURE

The present communication presents only a limited set of results of the full study that is presently being undertaken. Other 16th century azulejos and faience fragments are being excavated and we will be able to present further interesting examples in the future as a result of our cooperation with the essential work that archeologists are doing. Today these results are attracting more attention and we can see the real importance of these discoveries in the context of the initiation of azulejo production in Portugal, from Flemish roots to Flemish workshop-masters working in Lisbon [12].

However many excavations were carried-out in the past where the information has been lost as we can read in the 1872 testimony by Ribeiro Guimarães: "Mr. José Valentim (to whom we owe the preservation of the 16<sup>th</sup> century panel of Nossa Senhora da Vida that can be seen in the Museu Nacional do Azulejo) stated that at some excavations in the area of Olarias (in Lisbon) he found fragments of azulejos similar in production and painting, colours, etc, to those in the Chapel of Nossa Senhora da Vida. This incontestably demonstrates that in the 16<sup>th</sup> century the art of [majolica] production had already reached a level of perfection in Portugal" (O Sr. Jose Valentim nos affirmou que, em umas escavações no sitio das Olarias, encontrara fragmentos de azulejos, eguaes na fabricação, e na pintura, cores, etc., aos da capella da Senhora da Vida. Este facto,

que é incontroverso, mostra que no seculo XVI, estava em Portugal mui aperfeiçoada a arte de oleiro) [8].

Well, we hope that many interesting azulejos, long lost in depots and archives of excavation finds, can still be dug out once again from their resting places and brought to light to be identified and studied in order to bring a more complete understanding of this exciting period of less than three decades that started a course of events that lead to the flourishing art of the azulejo in Portugal.

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