Study of the azulejo panels in Graça church signed by João de Góis

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ABSTRACT

After the panels of São Roque (Saint Roch) chapel in Lisbon, signed and dated, the incomplete and dispersed panels in Graça church are the second set of Renaissance azulejos produced in Lisbon that was found to be signed.

A selection of azulejo samples obtained from the panels has now been studied by scanning-electron microscopy coupled with energy-dispersive spectrometry (SEM-EDS). Samples from the azulejos on which is painted the image of the book bearing the signing monogram have been used to establish a morphological and analytical reference aimed at identifying in the future a common officinal provenance in azulejos of the same general chronology known or presumed to have been produced in Lisbon.

This paper attempts a partial reconstitution of the panels and discusses their original emplacement. It also reports the results of the analytical study identifying the main micro-morphological features and the compositional variations that may be ascribed to different chronologies.

RESUMO

Depois dos painéis da Capela de São Roque em Lisboa, assinados e datados, os painéis incompletos e dispersos da Igreja da Graça foram o segundo conjunto de azulejos renascentistas produzidos em Lisboa onde foi reconhecida uma assinatura.

Uma seleção de amostras de azulejos dos painéis foi agora estudada por microscopia eletrónica de varrimento acoplada a espectrometria de energia dispersiva (SEM-EDS). Os azulejos que compõem a imagem do livro onde se pode ver o monograma que assina os painéis foram utilizados para estabelecer um modelo morfológico e analítico destinado a identificar, no futuro, uma proveniência oficinal comum em azulejos da mesma época que se presuma terem sido fabricados em Lisboa.

Este artigo apresenta uma reconstituição parcial dos painéis e discute a sua localização original na igreja. Inclui, também, os resultados do estudo morfológico e analítico identificando as principais características bem como as variações composicionais que podem ser atribuídas a diferentes cronologias dos azulejos que compunham os painéis.

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1. ON THE WALLS OF GRAÇA CHURCH

On the walls of the ante-sacristy of Graça church in Lisbon subsist parts of several azulejo panels decorated with grotesque motifs that suggest an early chronology (Figure 1). The incomplete panels have been reported by other authors [e.g. 1, pp. 108-109] and ascribed to the 2nd half of the 16th century based on the decoration. They were also often assumed to be of Portuguese production, although that assumption was never objectively proved.

In December 2014 we obtained an authorization from the church to make an exploratory inspection of the tiles, during which the painted monogram of the workshop master (and presumably also one of the painters of the original panels) was found [2]. That monogram (Figure 2) has been conclusively identified as that of the elusive João de Góis, a Flemish faience and tile manufacturer until now known only from an inquisitorial process for heresy of 1561/62 [3] and from a tally of professionals living in Lisbon, made in 1565, for taxation purposes [4]. He signed six times his declarations to the inquisitorial board with the same monogram (Figure 3).

Figure 1. Two aspects of the dispersed grotesque azulejo panels in Graça church. The monogram is painted on the book held by a figure seen on top of the right hand image

Figure 2. The monogram signing the panels

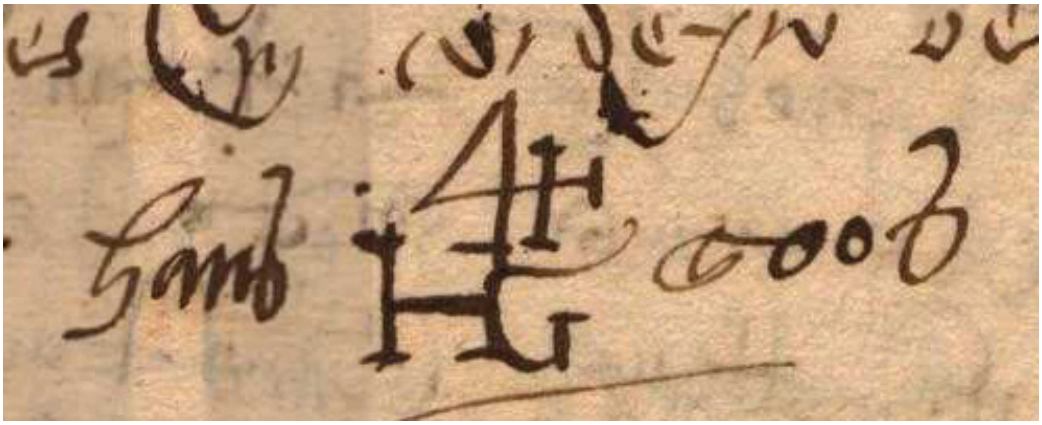

Figure 3. João de Góis' monogram
Source: Arquivo Nacional Torre do Tombo, PT-TT-TSO-IL-28-6820_m0025

From the images acquired during the visits, a first graphical reconstitution of the panel remains was attempted resourcing to digital technology and the dispersed tiles started being assembled into what may have been a main panel once bearing a shield of arms together with smaller panels and pilasters (Figure 4).

This amazing collection of panels composes a striking and imaginative set of images that reflect a bizarre array of figures in what is probably the most accomplished example of grotesques in Portuguese azulejos. Contrary to other examples, most notably those at São Roque chapel in Lisbon [5] but also the dissociated panels in the Santa Maria da Graça church, in Setúbal [6], whose background in yellow contrasts with the motifs in white outlined in blue, the panels in Graça church are related to, among others, the Italian *frescoes* tradition. The option of using a white background as a means to emphasize the different hues of the colours that are used, sets the rule for what was to come in the following century and has no comparison with other known surviving contemporary examples. Only in some of the *Quinta da Bacalhoa* azulejo panels do we have a white background, notably in the series of the river sources [1, Est. XXXV] but the painter of those panels did not master the possibilities of the colours as in this case.

Figure 4. Proposed reconstitution of several of the panels

What was the purpose of such an extravagant and certainly costly set of panels? What was the intention that justified such a lavish of talent and where were they intended to be placed? We do not have yet any information regarding such aspects, however it is important to bear in mind that the use of grotesques was not solely decorative. Often these now bizarre-looking compositions had an intention more or less hidden in the combined elements. When, in 1562, the painter Taddeo Zuccaro was made responsible for the decoration of the Farnese Palace at Caprarola, referring to the Room of Aurora, the sleeping quarters of the Cardinal Alessandro Farnese, he wrote "for it I will do grotesques or small stories whose nature will be according to the subjects already referred and those in relation with their neighbourhood" (*pour laquelle je ferais des grotesques ou des petites histoires dont la nature devrait être conforme aux sujets déjà indiqués, et ceci en fonction de leur voisinage*) [7]. And so, among the fantastic elements one can see in that room that are usual in such decorations, appear *The Night*, *Aurora*, *The Moon* and *Mercury*. This of many possible examples intends to establish the possibility that there may have also been an intention other than aesthetic in the elements of the panels that were painted for Graça church.

Considering what may be assembled together at this time, it is possible that the panels once lined a chapel (Figure 5). The two mirror-like panels, in one of which is the monogram of João de Góis, may have once been a single panel set at the back of the chapel.

Figure 5. Proposed digital reconstruction of a hypothetical architecture incorporating the panels

But if they were meant for a chapel is it possible to define its purpose? Can we advance some hypothesis in hopes that it may one day be verified (or not) on documental grounds? Looking at the elements that are depicted in these panels one can see several candles and an assorted variety of thuribles, objects that are related to religious worship.

More unusual seem to be the scissors and the books in the hands of the two figures. One possible interpretation stems from an association to a mortuary chapel: the books would bear the narrative of the life of the deceased while the scissors meant the cutting of the thread of life and the domed eight-sided golden constructions with people or statues seen nearby could be an allusion to the thereafter.

2. EXPERIMENTAL

2.1. Samples

Samples were carefully collected from various tiles (Figure 6, Table 1), by removing small fractions of the glaze and biscuit with a scalpel. The samples were identified with the reference Az013 (corresponding to these panels at Graça church) plus an additional code to identify each sample (Table 1).

The sampling was conducted having in mind representability. Three of the samples pertain to the tiles adjoining the book bearing the monogram and these are identified as Az013/L1, Az013/L2 and Az013/L3 (Figure 6a). The corresponding analytical results will be the reference against which others are to be compared. Two of the samples pertain to adjoining tiles that have however remarkable differences in the colours and the painting and those bear the references Az013/T1 and Az013/T2 (Figure 6b). The sample identified as Az013/01 was collected from a tile once part of the frame (Figure 6c) and the other three (Az013/03, Az013/04 and Az013/07) from mixed up tiles (Figure 6d, 6e and 6f). In all cases the sampling was done on spots where the glaze was already partially detached.

Table 1. Samples collected for microscopic observation and analysis

Sample reference	Colour	Notes
Az013/01	yellow	frame tile
Az013/03	white + blue	misplaced tile with colour run
Az013/04	white	misplaced fragment
Az013/07	green	tile in a continuity group
Az013/T1	yellow	left side tile of thurible
Az013/T2	yellow	right side tile of thurible with colour run
Az013/L1	green	from book with monogram
Az013/L2	white	from book with monogram
Az013/L3	orange	from book with monogram

Figure 6. Some areas where the samples from the azulejo panels were collected – from left to right and top to bottom: a) Az013/L1, Az013/L2 and Az013/L3; b) Az013/T1 and Az013/T2; c) Az013/01; d) Az013/03; e) Az013/04; f) Az013/07

2.2. Equipment and technical methodology

The fragments detached from the azulejos were stabilized in epoxy resin, lapped and polished to obtain a flat surface for observation and analysis by scanning electron microscopy coupled with an X-ray energy-dispersive spectrometer (SEM-EDS).

The optical acquisition of sample images was made with a Leica DFC295 digital camera attached to a Leica M205C stereomicroscope.

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 the observations were made in backscattered electrons mode (BSE) with a chamber pressure of 40 Pa and at an accelerating voltage of 20 kV. The acquisition of X-ray spectra was done with the detector set at ca. 8 mm working distance.

The selection of areas for EDS analysis avoided inclusions in the glaze or biscuit representing more than ca. 5 % of the full area analysed. The area sizes were ca. 200 x 200 μm^2 for glazes and 500 x 500 μm^2 for biscuits but acceptable repeatability was verified in areas four times smaller. For comparison purposes, only the elements usually representing the major contents were considered, excluding tin (Sn) in the glaze and lead (Pb) in the biscuit due to their variability with the area chosen (in the case of Sn because of local aggregations of SnO_2 crystals; in the case of Pb because its content in the biscuit increases with proximity to the interface with the glaze). The results of the EDS analyses are given in weight % of each element identified.

Principal component analysis (PCA) was made of EDS results using the SPSS® software platform by IBM Analytics.

2.3. Results

2.3.1. Glaze morphology

Figure 7 shows the sections of samples Az013/01 and Az013/L3, both from yellow areas and both depicting the use of *coperta* – a final layer of transparent glaze sprinkled over the pigment to render the finish shinier and protect the superficial colour from abrasion.

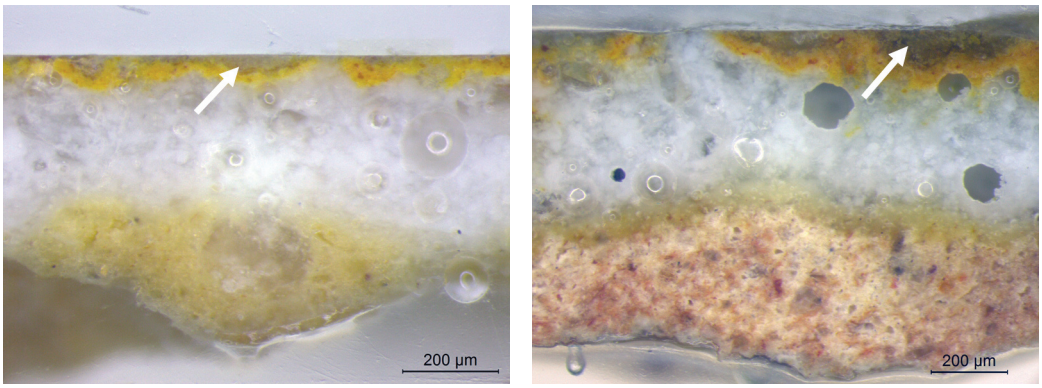

Figure 7. Use of *coperta* in samples Az013/01 (left side) and Az013/L3 (right side) – the arrows indicate spots where drops of transparent glaze fell

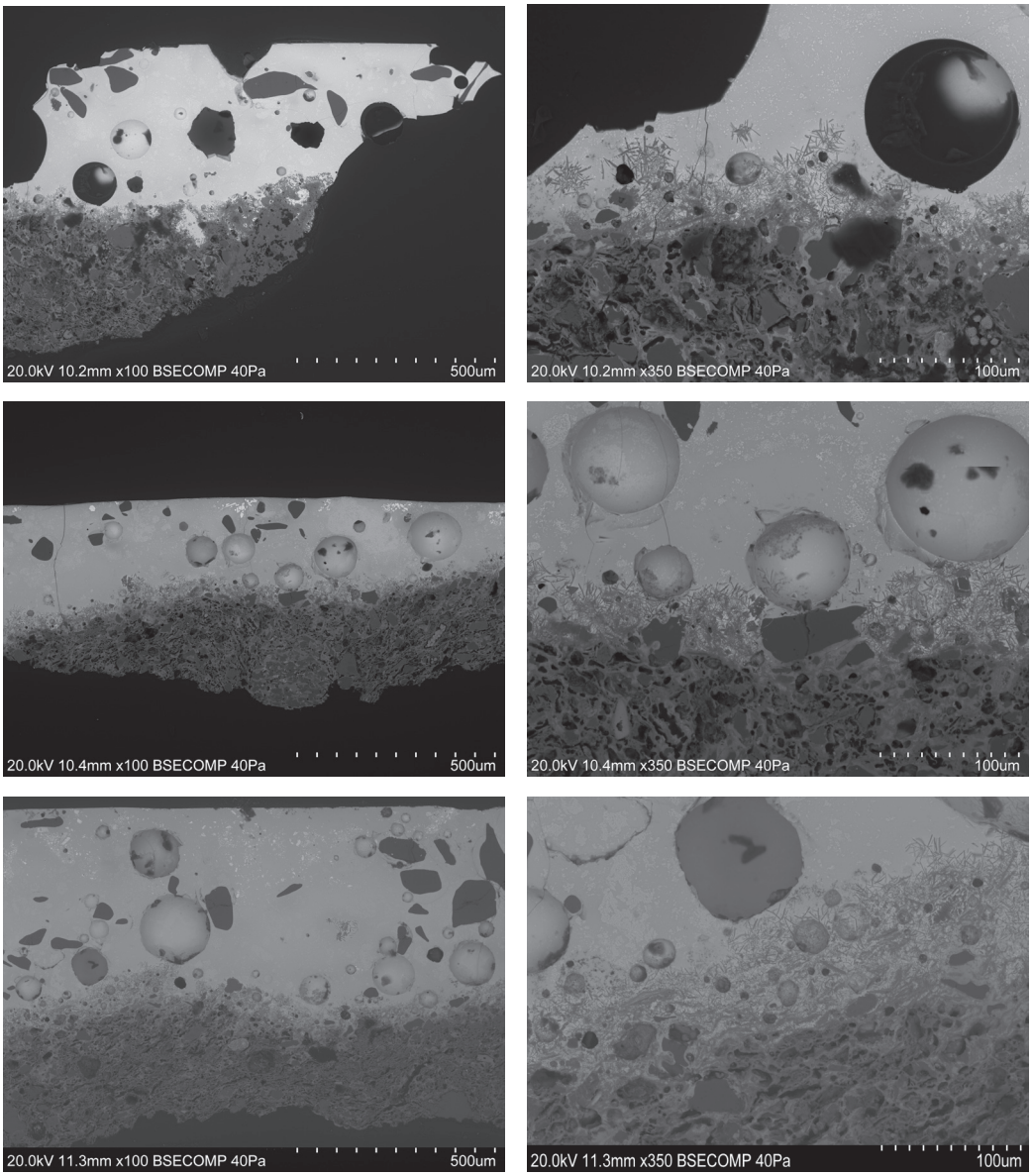

Figure 8. SEM images showing the glaze and the interfacial micro-morphology in (from top to bottom) samples Az013/L1; Az013/L2; and Az013/L3

Figure 8 depicts SEM images of samples Az013/L1, Az013/L2 and Az013/L3 that exemplify the main micro-morphologic characteristics associated with the white glazes of the workshop of João de Góis for Graça church: few inclusions, mostly large-sized grains of sand; interface glaze-biscuit with abundant crystals formed during the second firing. Both can be considered distinctive and the interfacial outgrowth is a particularly striking one that we had previously seen with similar profusion in white glazes only in some Hispano-Moresque tiles [8; 9 pp. 161-196]. This morphology likely results from the firing technology used, with long firing and cooling times [10; 11]. The glazes of all nine samples studied were morphologically similar with minor variations in the

size and shape of the interfacial outgrowths. These neoformation crystals are probably K-feldspars (Figure 9) and have been identified by other authors as a variant of a Pb--enriched sanidine [12]. Their size depends also on the availability of potassium minerals in the contact zone of the molten glaze with the biscuit. When e.g. the interface is locally formed of silica, the outgrowths are absent and in such cases the aspect of the interface may vary from one side of the section to the other, according to the minerals sectionally available.

When inclusions of minerals rich in potassium are present in the glaze, similar outgrowths are often seen. If the inclusions are thin scales (maybe a mica introduced with the sand) similar crystals grow out from them resulting in a characteristic centipede morphology (Figure 10) that has been found in several of the samples observed.

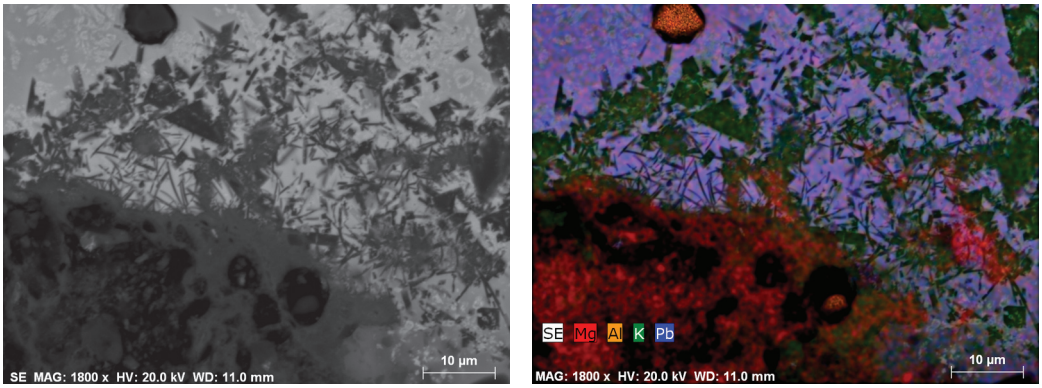

Figure 9. Detailed view of the interface in sample Az013/T1 showing the outgrowth of crystals rich in Al and K

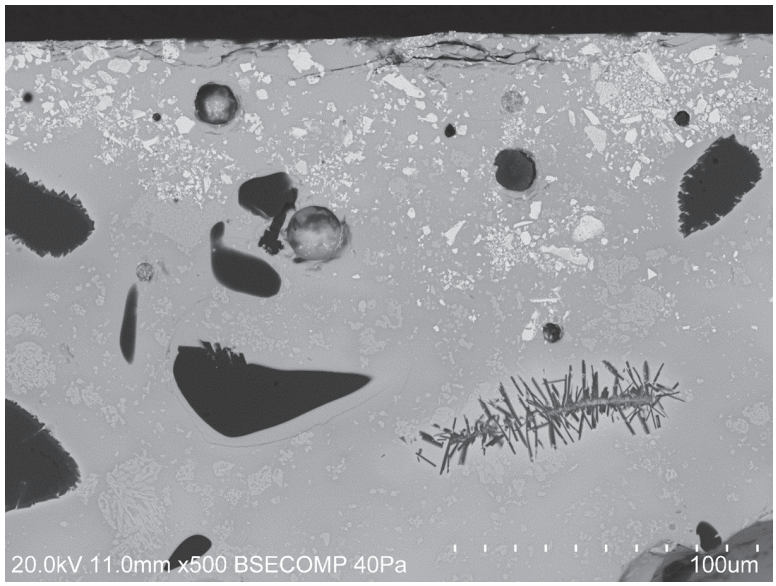

Figure 10. The presence of thin scales of a K-rich mineral in the glaze, possibly a mica, originates crystalline outgrowths with a very characteristic centipede-like morphology (seen here in Az013/04)

2.3.2. Glaze composition

Table 2 includes the semi-quantitative results of analyses of the glazes by EDS in weight %. Sn was excluded for the reasons pointed out in section 2.2. The amount of oxygen was calculated through the remaining elements stoichiometry considering their most commonly considered oxides (Na_2O, MgO, Al_2O_3, SiO_2, K_2O, Fe_2O_3 and PbO). The results were normalized to 100 % and the table also indicates the ratios Si/Pb.

Table 2. Semi-quantitative composition (% w/w) of the glazes determined by EDS (weight of the elements normalized to 100 %) and Si/Pb ratio

Sample	Na	Mg	Al	Si	K	Fe	Pb	O	Si/Pb
Az013/01	1.6	0.3	2.3	23.2	2.9	0.7	36.0	32.9	0.64
Az013/03	1.9	0.8	4.3	17.9	1.6	1.6	42.0	29.8	0.43
Az013/04	1.9	0.9	3.5	16.3	1.4	1.2	47.4	27.4	0.34
Az013/07	1.8	0.8	2.4	21.1	2.4	0.8	39.5	31.2	0.53
Az013/T1	1.0	0.3	2.7	17.9	1.0	0.7	48.7	27.6	0.37
Az013/T2	1.7	0.7	3.2	19.4	2.2	0.6	42.2	30.0	0.46
Az013/L1	1.2	0.4	2.9	19.5	1.7	0.5	44.2	29.5	0.44
Az013/L2	1.1	0.5	3.3	20.2	1.9	1.1	41.2	30.7	0.49
Az013/L3	1.3	0.5	3.3	19.0	1.6	0.8	44.1	29.4	0.43

Figure 11 shows the results of a log-based principal component analysis (PCA) of the glazes of all samples, considering the analytical results in Table 2, through a plot in the plane of the two first principal components (PC1 and PC2). PC1 explains 50 % of the variation and is controlled in the positive sense mostly by the contents in Al, Fe, Mg and Pb, and in the opposite sense by the contents in Si and K as can be seen from the loadings plot of Figure 12 in which the projections of the vectors on an axis show the contribution of each element to the respective principal component. PC2 explains 33 % of the variation and is controlled in the negative sense by the content in Pb (Figure 12).

The PCA analysis also determines the correlation between the variables considered and Table 3 presents the correlation matrix obtained for the elements quantified in the glazes. A high correlation between Si and K is to be noted, meaning that both elements increase and decrease in line, while between Si and Na the correlation is practically nil meaning that the variation of each element is irrespective of the variation of other.

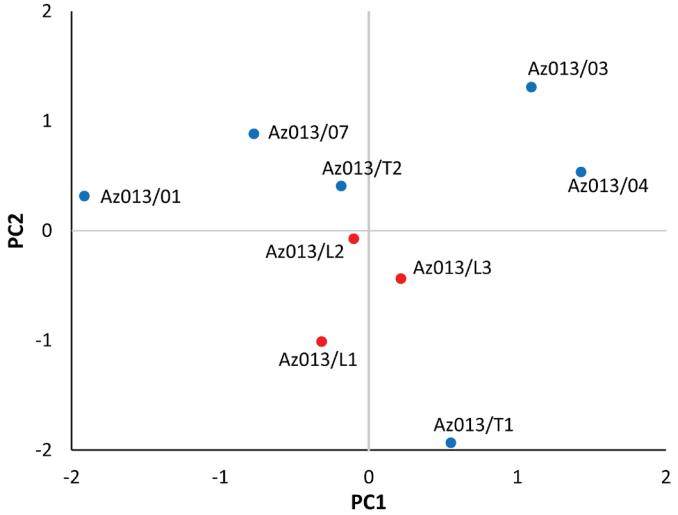

Figure 11. Score plot of the PCA analysis of the glazes in which the reference samples Az013/L1, /L2 and /L3 are depicted in red. The results do not suggest any evident clusters

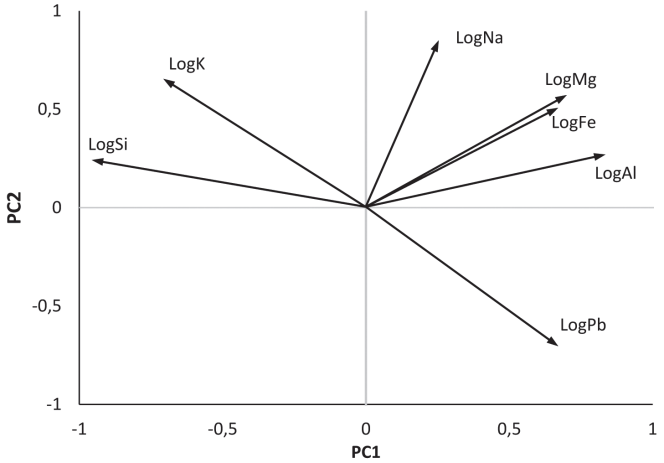

Figure 12. Loadings plot of the PCA analysis of the glazes

Table 3. Correlation matrix for the analysis of the glazes

	LogNa	LogMg	LogAl	LogSi	LogK	LogFe	LogPb
LogNa	1.0	0.65	0.21	**-0.04**	0.46	0.38	-0.36
LogMg		1.00	0.57	-0.51	-0.03	0.53	0.18
LogAl			1.00	-0.68	-0.39	0.61	0.38
LogSi				1.00	**0.83**	-0.39	**-0.88**
LogK					1.00	-0.17	-0.94
LogFe						1.00	0.02
LogPb							1.00

2.3.3. Biscuit composition

Table 4 includes the semi-quantitative results of analyses of the biscuits by EDS in weight %. Pb was excluded for the reasons pointed out in section 2.2. The amount of oxygen was calculated through the remaining elements stoichiometry considering their most commonly used oxides (Na_2O, MgO, Al_2O_3, SiO_2, K_2O, CaO and Fe_2O_3). The results were normalized to 100% and the table also indicates the ratios Ca/Si.

Table 4. Semi-quantitative composition (% w/w) of the biscuits determined by EDS (weight of the elements normalized to 100 %) and Ca/Si ratio

Sample	Na	Mg	Al	Si	K	Ca	Fe	O	Ca/Si
Az013/01	1.8	4.2	8.4	21.1	2.1	15.0	4.2	43.2	0.71
Az013/03	1.9	2.6	9.4	20.4	2.4	17.0	3.5	42.8	0.83
Az013/04	1.6	1.6	8.4	26.5	2.5	10.8	3.2	45.5	0.41
Az013/07	1.4	3.9	8.6	23.8	1.4	12.5	3.7	44.7	0.52
Az013/T1	1.5	1.6	8.4	26.2	3.4	10.2	3.5	45.2	0.39
Az013/T2	1.3	2.2	9.3	21.4	1.4	17.0	4.1	43.4	0.79
Az013/L1	1.3	1.7	8.4	26.5	2.6	10.6	3.3	45.5	0.40
Az013/L2	1.2	1.4	8.3	26.8	3.2	9.2	4.4	45.5	0.34
Az013/L3	1.4	1.7	8.3	25.5	2.5	12.2	3.6	44.9	0.48

Figure 13 shows the results of a log-based principal component analysis of the biscuits, considering the analytical results in Table 4, through a plot in the plane of the two first principal components (PC1 and PC2). PC1 explains 57 % of the variation and is controlled in the positive sense mostly by the contents in Na, Al, Mg and Ca; and in the opposite sense by the contents in Si and K, as can be seen from the loadings plot of Figure 14. PC2 explains 19 % of the variation and is controlled in the positive sense by the contents in Na and K and in the opposite sense by the content in Fe (figure 14).

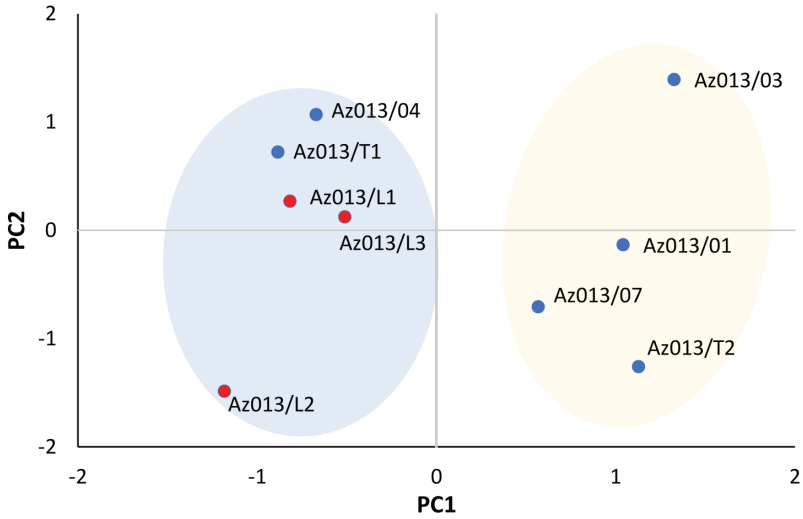

Figure 13. Score plot of the PCA analysis of the biscuits in which the reference samples Az013/L1, /L2 and /L3 are represented as red dots. The results suggest two different clusters, indicated in blue and yellow

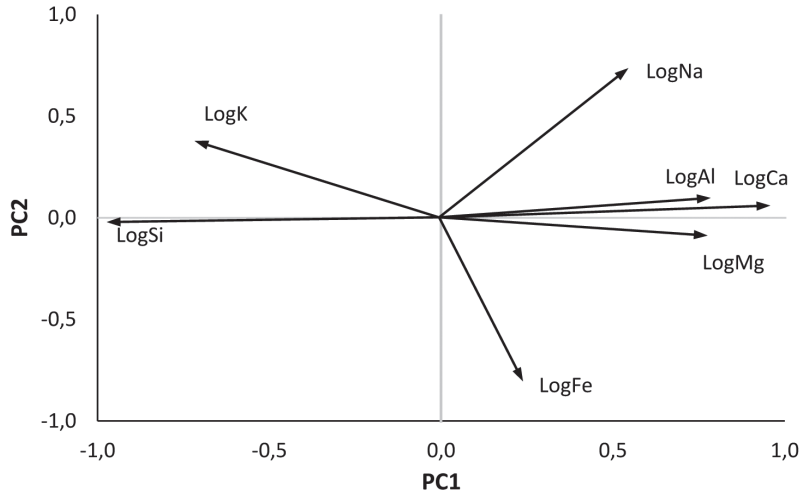

Figure 14. Loadings plot of the PCA analysis of the biscuits

3. DISCUSSION

All the samples are closely related in the fact that the glaze morphology and composition are similar (Figure 8 and Table 2). The low Si/Pb ratios separate them clearly from the typical 17th century compositions [8] while the interfacial morphologies (Figure 8) suggest they were all fired in similar conditions, likely in the same kiln. We have not found these combined characteristics in Portuguese productions of later centuries [8], nor in 16th century Seville productions [14; and our own results to be published],

or in Antwerp azulejos [8; 13], granting a possible recognizable characteristic for tiles produced within the same technological circle.

For the biscuits, two different sets are clearly apparent and their clusters are conveniently separated by the vertical PC2 axis of Figure 13. One comprises all of the reference samples Az013/L1, /L2 and /L3 as well as Az013/T1 and Az013/04 (blue area in Figure 13). All these are characterized by simultaneously a Ca/Si ratio under 50 %, a relatively high content in K and, in average, a lower content in Mg and Ca (Table 4). The other set is formed by Az013/01, Az013/03, Az013/07 and Az013/T2 (yellow area in Figure 13) and includes biscuits with Ca/Si ratios above 50% and higher Ca and Mg contents. The differences between the two clusters are clearly seen graphically in the representative biscuit EDS spectra shown in Figure 15.

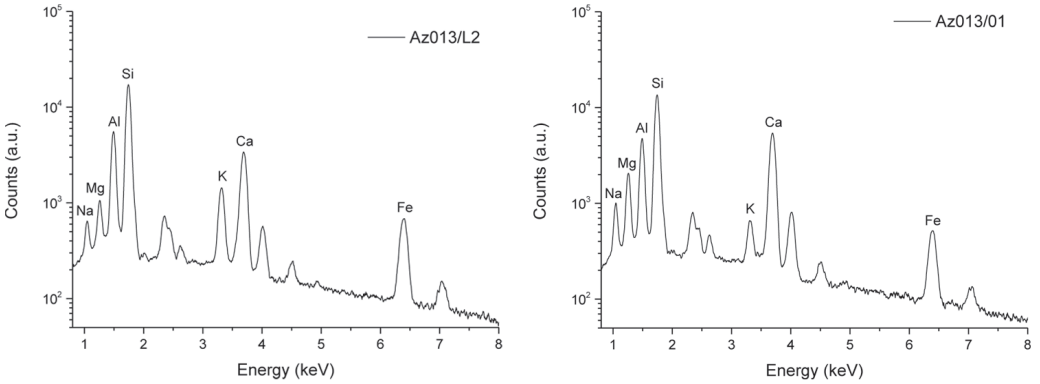

Figure 15. Relevant parts of the biscuit spectra of Az013/L2 (left) compared to Az013/01 (right) depicting the clear differences in the relative contents of Ca, Mg and K that characterize the two clusters of Figure 13

The biscuit is the part of the tiles usually produced exclusively from local materials. The two separated clusters of Figure 13 may result from the use of two different marls for the preparation of the paste, or else from a mixture of two clays/marls, one of which richer in Ca, Mg and Na but poor in K, in two different proportions.

Considering the analytical results of the glazes through Table 2 and Figure 11 and the reference values of Az013/L1, /L2 and /L3, there are no correspondingly clearly separable clusters for the glazes. However, it may be noted that the samples that in Figure 13 are clustered in the yellow area lie, in the glaze scatter plot of Figure 11, predominantly on the upper side. This means that albeit not so clearly separable, the composition of the glazes of those samples is nevertheless also somewhat different.

Table 3 shows a strong correlation between Si and K, but not between Si and Na. On dealing with the preparation of the glazes in his 16th century treatise *Li tre libri dell'arte del vasaio* (The three books of the potter's art), Cipriano Piccolpasso describes the preparation of the *marzacotto* for the raw glaze following several recipes. Those more often mentioned are: i) a mixture of sand with calcined lees or tartar (potassium carbonate); or ii) the same with a third component- sea salt [15, pp. 62-81]. The correlations found mean that a recipe of the first type was probably used by the workshop of João de Góis, notwithstanding the local availability of sea salt.

The differences observed in the biscuits do not seem compatible with what could be

expected from tiles manufactured by the same workshop to fulfil a single order. The results obtained suggest that the tiles sampled were produced in at least two different instances. All can be set in the 16th century because later azulejos usually had a different composition [8] and through the observation of the changing interface morphologies we can state that the firing cycles of later tiles were also different [8; 11]. This fact may also explain the differences in colour and final result seen in adjacent tiles (e.g. as in the two tiles in Figure 6b from which samples Az013/T1 and Az013/T2 were collected and which, significantly, fell into different clusters).

Macroscopic observations concur with a production at different instances. Figure 16 depicts a close-up of the lobster figure and its chequered appearance shows that the tiles do not actually fit together. The outlines are the same because the same drawing was used on both cases but the fine details and colours are different suggesting that some tiles were painted in the workshop when the others were already applied on a wall. Whether two complete figures were made or a number of tiles was needed to repair an already existing lining remains unclear at the moment.

A confirmation of how many panels were there, what was their original size and, eventually, which were the original and earliest tiles, calls for a removal of the azulejos from the wall and a study of the marks on their backs that indicated their relative placement. It is hoped that such work may be done soon, aimed at repositioning the tiles correctly, and that then a more exhaustive sampling, better directed to the different chronologies, may be made.

Figure 16. The lobster figure as is today, seemingly assembled from two different sets of tiles

4. WHEN THERE ARE NO DOCUMENTS…

When there are no documents, hypotheses abound. If the elements in these grotesque decorations were meant to be references to a mortuary chapel, the most probable candidate in this church should be the chapel dedicated to Afonso de Albuquerque, the strategist of the Portuguese power in the Indian Ocean. Having died in 1515 in Goa, his remains only came to Portugal in 1566, through the efforts of his son Brás de Albuquerque (1500-1580). Probably because his grandfather and great-grandfather were already buried in this church, Brás de Albuquerque obtained an authorization for the remains of his father to be laid in its main chapel and in May 1566 he was buried there [16]. We have not yet found any reference to the decoration associated with the chapel but it seems likely that Brás de Albuquerque would be willing to pay whatever was needed, including a lavishly decorated azulejo lining, to make everything worthy of the glorious memory of his father of which he was justly proud. It is interesting to note that, although not unique in books at this time, the frontispiece of his capital work *Comentários de Afonso de Albuquerque*, first published in 1557, is decorated with a grotesque design (Figure 17). We should also keep in mind that in his villa and gardens of *Bacalhoa*, in Azeitão, a series of azulejo panels from the same period (one of them dated 1565) can still be seen [1, EST. XXXVIa] making it more plausible the possibility that the original renaissance panels of Graça were indeed commissioned by him.

Figure 17. Frontispiece of the first edition of the *Comentários de Afonso de Albuquerque* (Biblioteca Nacional de Portugal)

The remains of Afonso de Albuquerque were removed from the main chapel in 1635 due to the lack of payment for maintenance [16] and are still unaccounted to this day. The chapel was prepared for a new occupant who died in Madrid in 1640 but in the end was not laid there. Afterwards (at an unknown time) the chapel and the whole interior of the church were renewed [16]. Maybe at one of those instances the panels were dismantled from their original emplacement.

The finding of the monogram endowed these often-overlooked panels with a special value and allowed for an approximate dating. If one day they can be proved to be indeed related to the celebratory memory of Afonso de Albuquerque then a last remaining remembrance of his presence in the public area of Igreja da Graça has not been lost.

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