

Technical identification of the earliest productions of faience tiles in Lisbon

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SUMMARY

For one year since July 2017, the *Museu Nacional do Azulejo* (MNAz- Portuguese National Azulejo Museum), the *Laboratório Nacional de Engenharia Civil* (LNEC) and the HERCULES Laboratory of the University of Evora made a joint effort in the instrumental study of 16th century faience azulejos, aimed at identifying those of Portuguese origin based on their composition and the technology used and thus establish on firmer ground the origins of the production of faience azulejos in Lisbon.

Azulejo panels, loose tiles and fragments were collected by removing small fractions of the glaze (circa 1-3 mm³) with biscuit attached. Samples were as follows: seven samples of Hispano-Moresque azulejos from the collections of the MNAz and archeological excavations, believed to have been produced in Seville and expected to date from the first to the third quarters of the 16th century; five faience samples from Seville (four dated 1570-1596 and one presumed from the 17th century); and 20 samples from loose tiles or panels known or now attributed to the workshops of Lisbon from the 1560s to the 17th century.

The samples were stabilized in resin, cut to obtain a flat section 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 the 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 acquisition of spectra was done in the same conditions with the detector set at ca. 8 mm distance from the surface of the specimens.

All EDS spectra were acquired according to the recommendations given in [1] and saved in XY-ASCII format (*spx* file extension). They were processed by opening with the Artax™ spectral analysis PC software as used with the Bruker Tracer III and other XRF analysers of the same brand, and saved as spectral graphs.

Given the time for presentation, this communication will focus on only two sorts of information gathered: the morphology of the glazes and interfaces, which are related to the firing parameters, and the results of the EDS analysis of the glazes. This information will be shown to be sufficient to separate the productions in four distinct groups: Seville Hispano Moresque; Lisbon 16th century; Seville majolica (last quarter of the 16th century), Lisbon 17th century (possibly including late 16th century productions).

As an example, figure 1 compares the most relevant part of the compositional spectra (cut due to space restrictions), the glaze composition in major elements except Sn (which was excluded because the quantification varied too much in a single specimen with the chosen area due to local concentrations of tin oxide crystals) and sections of azulejos from two of the groups mentioned, depicting clear differences in what pertains to the Na-Mg-Al relative contents as well as to the glaze inclusions.

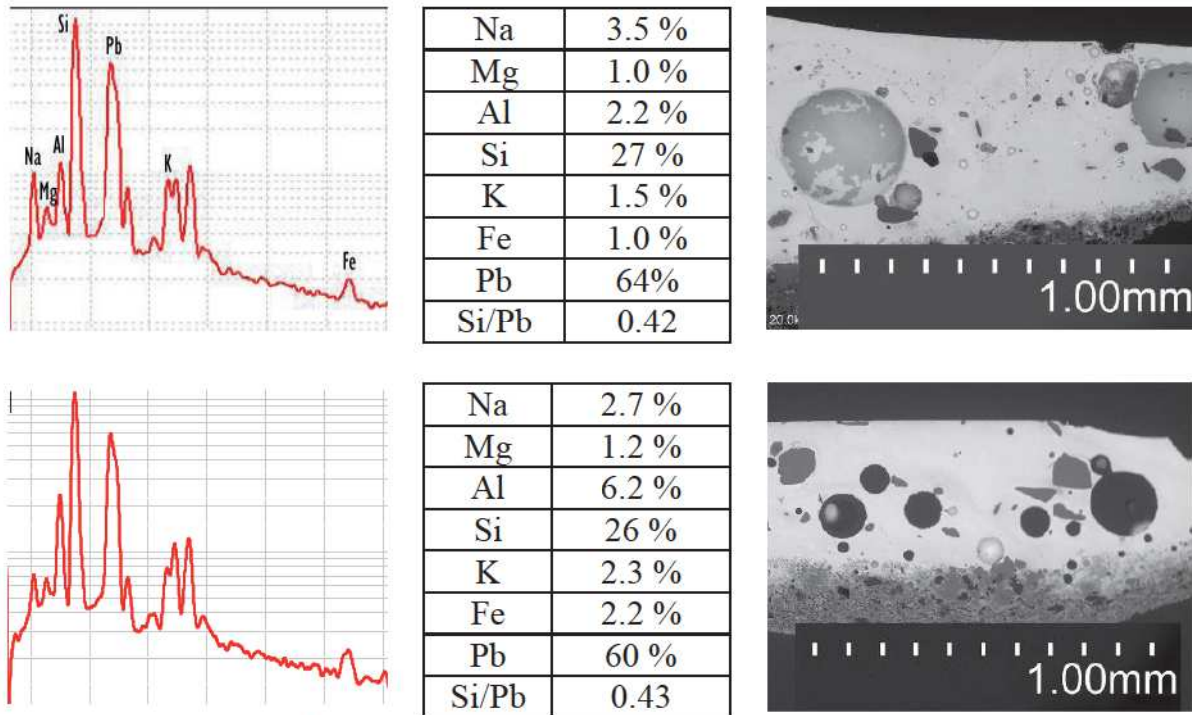


Figure 1 – Top: Az065 Hispano-Moresque tile presumably from the workshops of Seville; bottom Az013/03 ample from the renaissance panel signed “João de Góis” at Igreja da Graça in Lisbon.

Left to right: abridged EDS spectrum of the glaze between 0.6 and 7 keV; EDS quantification in weight of seven glaze elements corrected to 100% and Si/Pb ratio; image of a section of the glaze.

ACKNOWLEDGEMENTS

Communication produced as an outcome of Project FCT-AzuRe - Estudos no Azulejo Português para Candidatura a Património da Humanidade (PTDC/EPH-PAT/5096/2014) funded by FCT, the Portuguese Foundation for Science and Technology. S. Pereira acknowledges FCT for her Post-Doc Grant (SFRH/BPD/116807/2016).

BIBLIOGRAPHIC REFERENCE

1. MIMOSO, J. et al. – *On the use of glaze and biscuit X-ray spectra in heritage azulejos as beacons of provenance*, in Proc. GlazeArt 2018, LNEC, Lisbon 29-30 Oct.2018.