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Provenance studies of 18th century potassium-rich archaeological glass from Portugal

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ABSTRACT

The archaeometric study of a group of colourless glass fragments recovered from two archaeological excavations performed in Lisbon, Portugal is here reported. The archaeological interventions were performed at Rua do Arsenal (LRA), where the ruins of the Côrte-Real Palace were partially discovered, and at the Roman Theatre Museum (LTR), where the remains of a middle-class house dated to the 18th century were found. The recovered glass fragments are dated between the end of the 17th century and the 18th century, and were chemically characterised with the aim of discussing its provenance. Micro particle induced X-ray emission (μ-PIXE) and laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) were the chosen analytical methods to characterise the glass composition. All twenty-five fragments proved to be of a potassium-rich composition, where the choice of raw materials seems to have been made with extreme care. This is reflected in general by a composition with low levels of impurities, such as alumina and iron oxide, and high levels of silica.

Two compositional groups were identified, that besides differing in other components have different contents of arsenic oxide. None of the groups could be undoubtedly compared with the few known potassium-rich compositions from coeval glass production centres in Europe. The majority of the analysed samples could only be compared, in terms of major oxides, with the potassium-rich production from the Coina Glass Factory in Portugal.

1. Introduction

The potassium-rich glass formulation underwent significant changes in Central Europe in the 17th century, when glassmakers started making more effort in the selection and purification of the raw materials, more precisely employing new methods for the purification of ashes (Tait, 2004, p. 179; Kunicki-Goldfinger et al., 2005).

During the first half of the 18th century, Central Europe was producing three types of potassium-rich glass: ordinary glass, white chalk glass, and potassium crystal glass (Kunicki-Goldfinger et al., 2005). The ordinary glass was the successor to the medieval forest glass and was produced with sand, lime, potassium-rich ashes from a vegetable origin, and pyrolusite. The white chalk glass (an uncoloured and transparent glass called like this to equate it to the Venetian soda-rich formulation of vitrum blanchum) was the result of adding chalk to the batch instead of limestone. For this formulation, a more careful selection of raw materials was made, followed by some purification steps. The potash from vegetable origin was partially replaced by saltpetre, with the addition of some new materials to the batch, such as arsenic and tartar of wine. Finally, for the crystal glass formulation high quality raw materials were needed. Saltpetre could almost totally replace the use of potash. In terms of chemical analysis, the difficulty in distinguishing between chalk glass and crystal glass has been pointed out (Kunicki-Goldfinger et al., 2005).

The conjunction of these improvements resulted in an almost uncoloured and much harder glass than the soda-lime-silica glass used at that time in Venice and the other European workshops producing glass in Venetian style. The use of this harder matrix led to the creation of thick-walled vessels particularly suitable for the employment of cutting and wheel-engraving (Tait, 2004, p. 179).

Considering the shapes, the objects created with the new Central European crystal glass were occasionally influenced by Murano forms, but most commonly they were inspired by German products as the goblets and beakers with lids and tall knopped stems frequently found in the region of Nuremberg. In terms of engraving motifs, it is possible to find floral stylised and naturalistic themes, small birds, small human figures, these evolving later into real engraved portraits, hunting scenes, biblical scenes, and so on. These decorative techniques were perfected to such a degree that this became the image of the Bohemian Baroque (Uresová,

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1965, p. 7,8). Typically produced in Central Europe were also double-walled glass with enclosed etched silver or gold foils that were also engraved (Zwischengoldgläser) (Rydlová and Drobny, 2007). Furthermore, some glass objects were decorated with the Schwarzlot (black lead) painting technique, used both in glass and in porcelain (Liefkes, 1997, pp. 64–65; Uresová, 1965, p. 9).

During the 18th century, Bohemian glass was so fashionable that it was exported all over Europe, and its trade was so well organised that it had established offices in important European and overseas trading centres, especially in Spain and Portugal (Lukàs, 1981).

Despite the fact that during the end of the 17th century the new potassium-rich glass formulations in Central Europe, together with the reinvented lead glass in the British Isles, have revolutionised the glass industry at that time, the potassium-rich glass has seldom been so far the object of sound investigation and characterisation.

1.1. Glass in Portugal

In the Portuguese panorama, until the end of the 17th century, as far as we know, the glass circulating in the national territory (either presumably produced here or imported) was of a soda-rich composition (Coutinho, 2016; Coutinho et al., 2016a, 2016b; Lima et al., 2012). This suggests that Portugal followed a Mediterranean glass-making tradition, and that the trading in glass with the North and Central European areas was low or inexistent. This reality seems to experience some changes in the 18th century, when the European innovations in terms of glass formulations (the development of lead glass and potassium-rich glass) start to appear in the Portuguese territory, becoming very quickly almost exclusive (Coutinho, 2016; Pulido Valente et al., 2016).

Even though, until now, only one Portuguese glass production location was excavated – the Coina Royal Glass Factory, active between 1719 and 1747 – a considerable number of furnaces in national territory is reported in historical documents. On the south bank of the Tagus River, the kilns from Salvaterra de Magos and Moita were very important glassmaking points during the 17th century. Their furnaces were the precursors of the Coina glass manufactory and their activity continued until the middle of the 18th century. In 1768, a contract was made between two German entrepreneurs (João Galo and João Jorge, the original German names unknown to us were adapted to Portuguese in the written documents) and the Salvaterra de Magos glass manufactory, with the intent of making its production closer to that of the Bohemian tradition (Custódio, 2002, pp. 52, 54).

The Royal Glass Factory in Coina employed glassmakers from Catalonia, England, Ireland, Flanders, Italy, and Germany, and from 1731 to 1747 it was managed by foreign administrators, such as the Englishmen Joam Butler (1731–1737) and Joam Poutz (1737–1741), and the Irishman John Beare (1741–1747) (Custódio, 2002, p. 101). The Coina Glass Factory was then closed and transferred to Marinha Grande, where more pinewood was available. The manufactory continued its activity there until 1992, with only a few interruptions (Amado Mendes, 2002, pp. 59, 62; Custódio, 2002, pp. 229, 232).

According to J. Custódio, glass à la façon de Bohème was being produced in the Coina Glass Factory during the first half of the 18th century (Custódio, 2002, p. 113). Archaeological excavations were carried out both in the area where the Coina glass manufactory had been established (Custódio, 2002, p.13) and in the Marinha Grande location. Some of the glass fragments recovered and believed to belong both to the Coina and Marinha Grande manufactories, spanning from the 18th to the 20th century, were analysed and preliminary results were published (Lopes et al., 2009; Schalm et al., 2005).

Despite the lack of information on the types of glass formulations produced in these factories, it is possible to make some speculations when resorting to historical documents. In 1739, reports were written by Bohemian glass dealers complaining about the ban of Bohemian glass imports to Portugal, which led to the conclusion that the glass produced nationally would be sufficient to fulfil market needs (Vávra, 1954, p. 93). This complaining was probably related to the document signed by D. João V on the 10th of May of 1734, in which the Portuguese king forbade the import of foreign glass (Custódio, 2002, p. 95). As has been mentioned above, during the 18th century Portugal and Spain were two of the main Bohemian glass trading centres (Lukàs, 1981, p. 60), which implies that these restrictions must have substantially affected Bohemian trade agreements and routes.

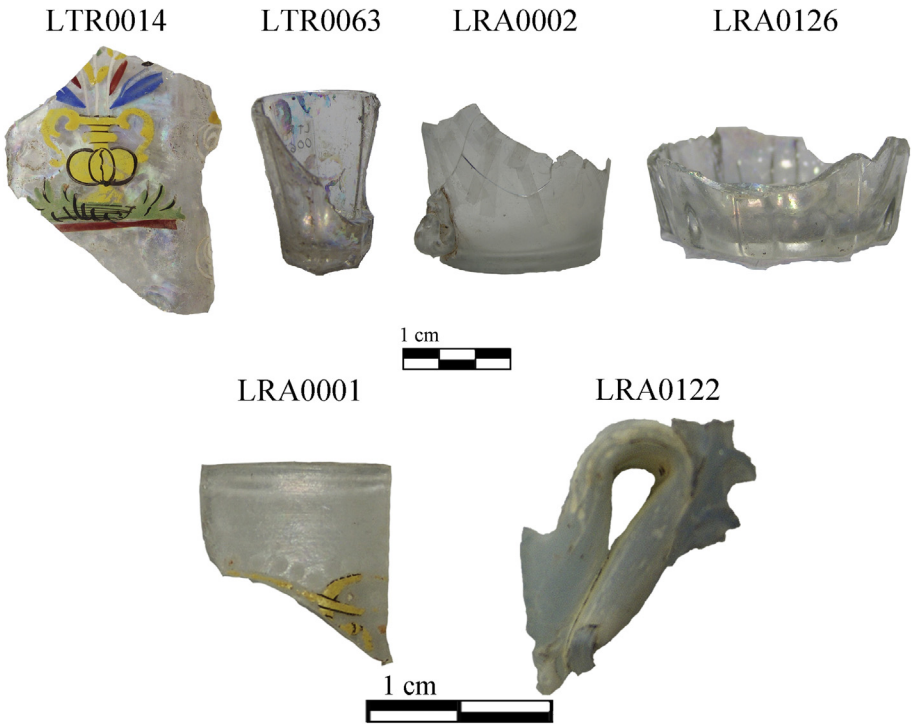

Fig. 1. Example of potassium-rich objects from the LTR and LRA assemblages under study. It is possible to observe mould-blown, enamelled, and engraved decorations.