Proceedings of the
5th GLASSAC International Conference

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Editora: **NOVA.FCT Editorial**
Coleção: **Actas e Proceedings**

Título: **Proceedings of the 5th GLASSAC International Conference**

Editores: **Inês Coutinho, Teresa Palomar, Susana Coentro, Andreia Machado e Márcia Vilarigues**
Autores: **Autores vários**
Capa e arranjo gráfico: **Um Ovo a Cavalo, Lda.**
Impressão e acabamento: **Espaço Gráfico, Lda.**
1º edição **Maio 2017**
ISBN: **978-989-99528-3-6**
Depósito Legal:

GLASS SCIENCE in Art and Conservation 2017

An international conference devoted to the applications of science
to glass art and the conservation of glass artifacts

6 - 9 June 2017
FCT NOVA
Campus de Caparica, Portugal

Organized by
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Faculty of Fine Arts, University of Lisbon
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Acknowledgments

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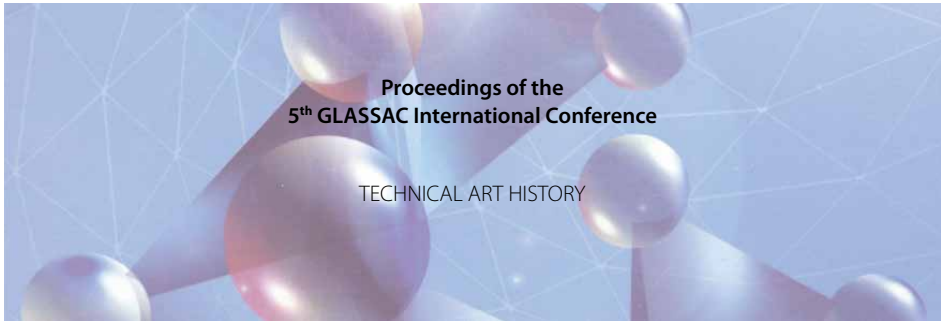

The use of glass in medieval pigment making

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Field of interest: Glass history, Technical art history

Introduction

The use of glass, under many forms and with different functions, in medieval recipes for the production of pigments to be used in medieval manuscripts' illuminations, is discussed.

The Portuguese book "O Livro de komo se fazen as kores das tintas todas" (LKSK), in English "The book on how to make all the colours", dated to the 15th century will be examined as a case study. This book, which is a compilation of several recipes that can be traced back to the 13th century, has been the subject of interest of several scholars (Afonso, Cruz, & Matos, 2013; Matos & Afonso, 2014; Melo & Castro, 2016; Strolovitch, 2010), and is currently in the focus of a larger project being developed at the Department of Conservation and Restoration from the FCT/ UNL (Melo & Castro, 2016).

The purpose of the current study is to identify those recipes in the manuscript that mention glass, directly and indirectly, in many forms and functions. Thereby, we intend to gain a better understanding of the presence and importance of glass in the medieval scriptorium.

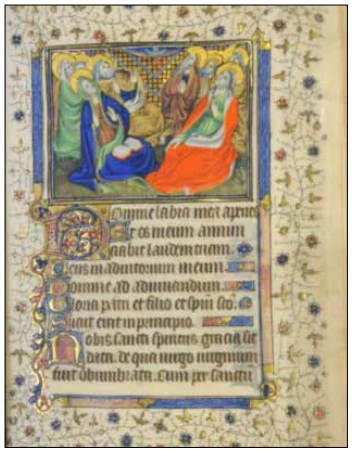
Keywords: Glass vessels, Glassmaking furnaces, Pigment recipe book, Medieval period

Discussion of ideas and possibilities

The manuscript's first recipe, "Oro Musiko" (mosaic gold) mentions a glass vessel that is required for the making of a gold coloured pigment (Melo & Castro, 2016; Strolovitch, 2010). This colour was meant to imitate gold in order to substitute this expensive material in illuminated books, and it consists of tin (IV) sulphide (SnS_2). The recipe describes that, after all the required ingredients are gathered and mixed, the mixture must be filled into a glass container. This glass vessel must be wrapped in clay in order to withstand the fire. As soon as the pigment forms and the vessel has been cooled down to room temperature, the mosaic gold is retrieved by breaking the glass vessel (Melo & Castro, 2016; Strolovitch, 2010). The recovered pigment that should look like a golden bar has then to be ground up well into a powder suitable for paint.

There are three possible interpretations of the use of the glass vessel in this recipe: 1) glass was such a common material and circulating in the national territory in such an abundancy that it was affordable to destroy a glass vessel; 2) mosaic gold was such an important and valuable colour that it was acceptable to destroy a glass vessel, even if the latter was comparatively valuable; and 3) parts of the broken glass may have deliberately been grinded together with the pigment, in order to enhance its brightness. Considering the scarcity of glass assemblages in Portugal that can be dated to the medieval period, and the relatively small number of glass fragments found in such assemblages, the 2nd and 3rd proposed hypotheses seem more likely. The recipe to make the mosaic gold was recreated in our laboratories without grinding the glass along with the pigment (Melo & Castro, 2016), but this hypothesis should be tested and compared with published analyses of this pigment from historical illuminated manuscripts. It should be added that this pigment was indeed found in Portuguese illuminated books (*e.g.* ***Fig. 1***) (Melo & Castro, 2016).

The second reference related with glass appears in Chapter Ten with a recipe to make very fine "Azarcão", in English red lead. In this recipe, it is described that after placing the needed ingredients in a vessel, this vessel has to be taken specifically to a glass furnace and be placed there for twenty-two days. After this period the pigment is ready to be used. However, no information regarding the temperature is given. Due to the experiments performed with the purpose of reconstructing the making of red lead from lead white, it was understood that placing the vessel inside the glass furnace, where the temperatures can vary between 700º and 1000º C, would result in the volatilization of the lead and consequently the loss of the main recipe component (Melo & Castro, 2016). In order to obtain red lead from white lead, the required temperature is around 470º C, so the vessel should have been placed outside the furnace or in a specific chamber, for instance an annealing chamber. We can discuss several factors that make this recipe really interesting, like the fact that a probable connection or proximity between glassmakers and other artisanal professions existed. Other important fact is the direct reference to a glass furnace. The book LKSK is written in Portuguese and the majority of the colourants described in the book can be found in Portuguese illuminated books so one can propose that the production of these colours were made in national territory. This implies the existence of glassmaking furnaces in Portugal in the 15th century, fact already proposed by Vasco Valente (Valente, 1950). But this simple reference to a glassmaking furnace seems also to suggest that these furnaces were probably easy to find in the Portuguese territory in the 15th century. Moreover, considering the temperature at which this pigment must be made one can propose that the artisan



a

b

c

Fig. 1 (a) Example of mosaic gold in a Book of Hours, Ms. 22, f.74, Palácio Nacional de Mafra (PNM), and (b) respective detail (available in http://www.dcr.fct.unl.pt/sites/www.dcr.fct.unl.pt/files/ArquivoDigital/). (c) Mortar and pestle made in glass, dated to the 17th century (Kerssenbrock-Krosigk, 2008, p. 145).

making the colourant knew that in order to obtain red lead from white lead, a high temperature was necessary, one close to the temperature the glass annealing chambers and so the advice of the glassmaker to choose the place in the furnace could be considered.

This supposed connection between artisans from different fields such as glassmaking and the book illuminating recipes, can be seen through an alchemist veil. Alchemy was practiced by scholars and workers from different areas, including the production of pigments and the making of innovative glass formulations like ruby glass (Smith, 2008), and alchemy was probably the common knowledge that connected these areas.

Conclusions and future work

From the point of view of glass history, we believe that the study of recipe books from different fields and from different chronological periods can bring new and exciting information about the importance and usage of glass objects.

Concerning the case study of the book "O Livro de komo se fazen as kores das tintas todas" LKSK presented here, it is discussed by Matos & Afonso (2014), that the names given to certain objects are not consistent along the book, and different designations are used when in reference to the same object, which might suggest that in certain recipes glass vessels were also used but not directly mentioned. From what was discussed above and looking carefully to the remaining recipes it is possible to imagine the usage of glass in its preparation. The presence of glass in Portugal during the medieval period needs to be further investigated. In the historically made reproductions of recipes collected from the book LKSK, glass vessels were often used for all kinds of compounds mainly because of its chemical inertia with a great number of substances. Moreover it is also worth mentioning that utensils like mortars and pestles were made in glass (see ***Fig. 1***) (Kerssenbrock-Krosigk, 2008, p. 145).

As future work, it will be important to study glass assemblages from monasteries that had scriptoria in order to gain knowledge about the glass objects which were used there. It is important to know what glass objects were available to the monks in order for them to create their beautiful colours and illuminated books. Based on the manufacturing of certain colours it is expected to bring new insights on the use of glass objects as a container material during the medieval period, especially in monasteries with scriptoria where the illumination books were made.

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Acknowledgements

The authors would like to thank the support of the Portuguese Science and Technology Foundation (FCT-MCTES) through the UID/EAT/00729/2013 project. The authors would also like to thank for the help of António Pires de Matos and Maria João Melo for the precious help improving this document.