

# TRADITIONAL AND MODERN BLUE PIGMENTS IN PORTUGUESE 19<sup>TH</sup> CENTURY TECHNICAL LITERATURE

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## ABSTRACT

19<sup>th</sup> century was a period of major chemical discoveries and industrial development that led to the emergence of new pigments. The technical literature of this century suggests that in Portugal traditional blue pigments, which had already been abandoned in other places, continued to be used, with some significance, at the end of the century. On the other hand, it shows that new pigments only began to appear, on average, about 50 or 40 years after their discovery or beginning of commercialization, respectively. However, in the end of the century, international trade marks such as *Lefranc* were already at painters' disposal.

Keywords: pigments; Portugal; nineteenth century; technical literature; painting treatises.

## Introduction

During the 19<sup>th</sup> century a large number of new pigments for artists appeared due to Chemistry great development and discovery of new chemical elements. Among others, cobalt, chromium, cadmium or zinc compounds gradually replaced many of the traditionally pigments. Factors largely contributing to the spreading of the new pigments and other materials through Europe were the chemical industry development, the establishment of several artists' materials manufacturers and the collapsible tubes invention in the middle of the century [1-4].

However, it is known that artists, both because of the expensiveness and poor properties (derived from the initial deficiencies of certain manufacture processes) of some materials, did not always rapidly adopt new pigments. For such behaviour other factors might have contributed, namely the personal resistance to innovation or change and the trade market limitations.

These questions have been ignored until now in relation to the Portuguese painting. Therefore, nothing is known about how were these new pigments regarded or when has their use begun. Integrated in a larger research that aims to clarify these issues, references to the blue pigments were collected from technical literature published in Portugal during the 19<sup>th</sup> century. The use of the traditional pigments was recorded and, for the new materials, the year when they were first mentioned and their importance according to the number of references found were established. Signs of innovation, persistence and disappearance in the use of materials were pursued. These results are discussed in the context of the 19<sup>th</sup> century technical literature published in other European countries, such as France or Great Britain, where several of the new pigments were first prepared and introduced. Attention was also given to the various historical and local designations attributed to pigments of this colour.

## Portuguese 19<sup>th</sup> century technical literature

In the course of the 19<sup>th</sup> century, the scientific and the industrial development led to the emergence of a new type of literature concerning artists' materials, focussed on physical and chemical subjects, which contributed to the growing gap between the materials'

knowledge possessed by artists and the materials' knowledge possessed by scientists and painters' manufacturers [5-7]. However, this type of literature was not common in Portugal and, until the end of the 19<sup>th</sup> century, the technical literature with information about the pigments consisted mainly of books of recipes or secrets, instructions for artists and encyclopaedic works, as in the previous centuries [8,9]. Among the exceptions, one can count the works of Diogo de Carvalho e Sampayo – cited by J. W. Goethe in its *Theory of Colours* –, already published in the late 18<sup>th</sup> century, and, in the beginning of the 20<sup>th</sup> century, two catalogues from an artists' materials seller.

Until the middle of the 19<sup>th</sup> century, Prussian blue, a pigment first synthesized in the beginning of the 18<sup>th</sup> century, is the only modern pigment mentioned in the Portuguese literature. It is cited by Sampayo, namely in the last of his books with information about pigments [10], in an anonymous translation from French, although not always respectful to the original, dated from 1801 [11], of a work attributed to François Xavier Vispré first published in France in 1756, and in two other books published in 1815 and 1841 [12,13], respectively, although the later is a revised edition of a original dated from 1817.

The first mentions to other modern pigments, that is, to pigments developed in the 19<sup>th</sup> century, and, consequently, the first signs of change may be detected only in 1840s, namely in two publications [14,15], even if the first was a revised edition of a work first published in 1794. Written as books of secrets, they integrate a collection of recipes for various fields of manufacture and testify the persistence of craft manufactures at the beginning of industrialization, which arrived late (and discretely) in the country. However, they are up-to-date in its references. Despite the fact that their references to colour materials are rather orientated towards the use of dyes in textile industry, new synthetic pigments were found here for the first time.

Publications from the second half of the century, or more specifically, from the end of the 19<sup>th</sup> century, remain heterogeneous. The first is a technical dictionary, written by the sculptor Francisco de Assis Rodrigues, which is considered a reference for materials and techniques [16]. It is a book that mentions a very limited number of new pigments and frequently cites a Portuguese treatise dated from the beginning of the 17<sup>th</sup> century. Probably, this situation can be partially explained by a smaller importance of pigments in sculpture and by a possible larger traditionalism of the officinal practices relating to the painting of sculptures – an activity frequently done by an artist that was not the sculptor.

Some years later, the painter Manuel de Macedo is the author of three small books on painting and restoration that are very informative about the pigments [17-19]. They confirm that by the end of the century several synthetic pigments circulated in the country and were used by painters. Among other works [20,21], two catalogues from the earliest years of the 20<sup>th</sup> century, published by an artists' materials seller (*Favrel Lisbonense*), were also found and used [22,23]. In addition to the systematic information provided by the detailed lists of pigments, they also show the provenance of the materials, since they carry the brand of the French manufacturer *Lefranc* – and, for that reason, many are named in French.

### **Blue pigments in Portuguese 19<sup>th</sup> century technical literature**

The blue pigments found in the literature just cited were separated in two different groups: traditional blue pigments and modern blue pigments. It must be pointed out that, in both groups, some difficulties arouse in relation to nomenclature: on the one hand, several

designations were employed for a single pigment; on the other, one designation applies to different pigments.

A specific problem is posed by the designation ultramarine blue found after the mid century: in some cases it is not clear whether it applies to the natural or to the synthetic variety. Consequently, in those cases the name and the material were not considered. In other cases, it is proposed an identification for the names employed, based on the information provided both by the analysed literature and the standard bibliography on the subject [5,24-27], although some doubts still remain.

Azurite [16], blues ashes [14,16,18,20,22], natural ultramarine [11-14,16,18,20], smalt [12,18,19], and indigo and indigo carmine [14-22] are included in the traditional group. Azurite was described as *azul montanha* and *azul de Castela*, names with origin in the 17<sup>th</sup> century treatise cited by Rodrigues [28]. Blue ashes are cited as *cinzas azuis* (or *cendre bleu*), a name that can be applied both to azurite and to its artificial variety, blue verditer. Probably it is the latter that is mentioned, but, as doubts still remain, that designation was kept. Natural ultramarine is named *ultramarino*, *azul ultramar*, *lâpis-lazúli*, *lazulite* and *azul celeste*. The interpretation of *azul celeste* as natural ultramarine results from the comparison of the Portuguese work [11] with the French original. Smalt was mentioned as *esmalte* and *azul de esmalte*. Indigo is named *indigo* and *anil*, while indigo carmine is described as *carmim de anil*, *azul da Saxónia*, *azul de Inglaterra* or *azul de Poerner*. Indigo carmine, although discovered in 1740, was considered in this group because its association to indigo [5].

Regarding modern synthetic pigments, five pigments were found: Prussian blue, cobalt blue, cerulean blue, artificial ultramarine and blue alizarin lake.

Prussian blue is mentioned as *azul da Prússia* [10,11,14-16,18,20,22-23], *anil da Prússia* [13], *prussiato de ferro* [14], *azul da Alemanha* [11], *azul de Berlim* [16,18,19], *azul de Antuérpia* [17-19], *flor de anil* [13,14,20], *azul mineral* [20,22,23], *azul da China* [22,23] and *azul mar* [13,14]. Among those names, many relate to different provenances, several are not obvious and require a brief explanation. *Flor de anil*, that is, indigo flower, a name that suggests indigo, is cited as a synonym of Prussian blue both in one of the mentioned sources [14] and in others sources [29]. In the case of *azul mineral*, that is, mineral blue, not only the equivalents in other languages are generally identified as Prussian blue, but also that identification is clearly supported by one of the catalogues [22] and a treatise published later [30]. *Azul da China* was identified through the chemical composition presented in one of the catalogues where it is mentioned [22] and *azul mar* was considered an equivalent of the French name *bleu de mer*, although some doubts remain regarding its meaning in one of the works [13].

Cobalt blue is mentioned under designations such as *cobalto* [17-20,23] and *azul de cobalto* [15,22,23], while cerulean blue is mentioned as *azul cerúleo* [22].

Artificial ultramarine is named *azul permanente* [19,23], *ultramar francês* [23] and, probably, *azul de França* [16]. The English and the French equivalents to *azul de França* (French blue and *bleu de France* or *bleu française*, respectively) are synonym for artificial ultramarine, but the French equivalent it was also applied to Prussian blue and, so, it was not clear the meaning of the Portuguese name. However, because in the same paragraph of

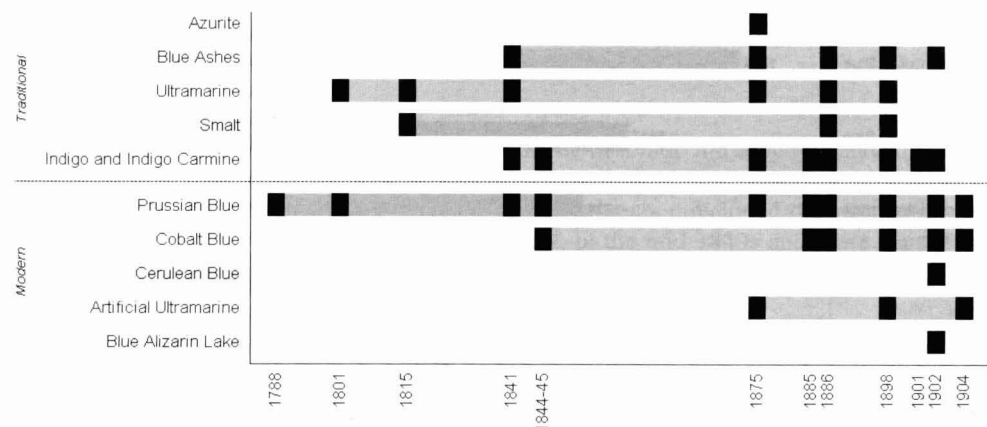


Figure 1. Blue pigments in 19th century Portuguese technical literature.

the book where the name appears [16], a reference to “Prussian blue or Berlin blue” already exists, it seems probably that *azul de França* applies to artificial ultramarine, which is not cited under another name and below that equivalence is considered.

Finally, blue alizarin lake is named as *laque de garance bleu*, in French [22].

In studied literature the name *bleu nouveau*, in French, [23], that is, new blue, was also found. However, since that name and the equivalents in other languages can apply to several blue pigments, namely Prussian blue, cobalt blue and ultramarine blue, and the Portuguese literature does not provide any clue, this pigment was not considered in the following discussion. *Azur* is another name found [20], but, by similar reasons, we were unable to identify it.

Figure 1 shows the date when each pigment is mentioned. Apart from azurite, which is only mentioned in one treatise, it is possible to see that the other traditional pigments are well represented throughout all the analysed literature and persist until the end of the studied period.

In relation to new pigments, Figure 1 reveals that Prussian blue is the only pigment cited during the entire century. Cobalt blue is referred in 1844 and the others are mentioned only in 1875 or after, although some of them were in the market several decades before that date.

For each pigment discovered in the 19<sup>th</sup> century, Figure 2 shows the time lapse between its discovery and the first reference to it in the Portuguese literature, while Figure 3 depicts the time lapse between its introduction in the European market and the first mention found in the literature. They show a large delay in pigments’ adoption. On average, 48 years pass between the discovery of a pigment and its mention in Portuguese technical literature and 37 years between the beginning of its commercialization and that appearance in the literature.

Prussian blue was not included in Figures 2 and 3 because a detailed research in the technical literature from the 18<sup>th</sup> century was not done. Consequently, we cannot say when this pigment has entered the Portuguese literature, although we found a reference to it in a commercial work dated from about 1759 [31], that is, about 52 and 35 years after its

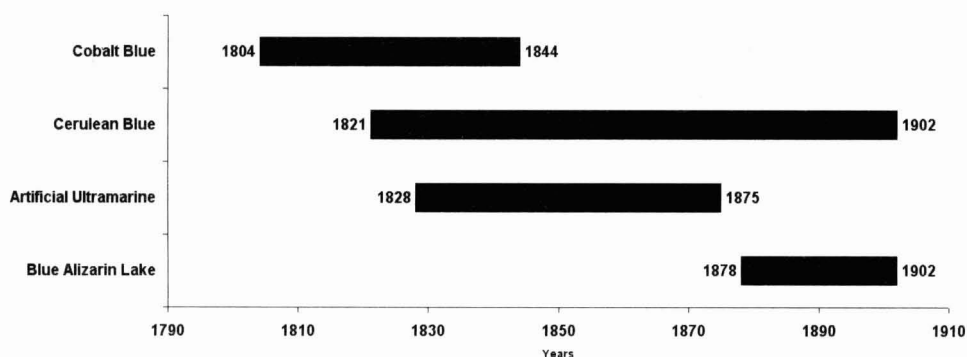


Figure 2. New blue pigments: discovery and first reference in Portuguese literature.

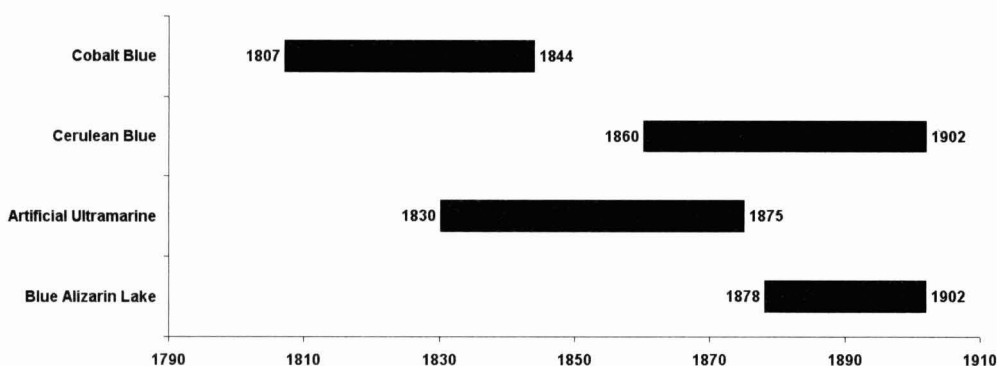


Figure 3. New blue pigments: market introduction and first reference in Portuguese literature.

discovery and commercialization, respectively. According to the author of this work from the middle of the 18<sup>th</sup> century, Prussian blue “is generally estimated, as ultramarine, and many give preference to it”. He also says that “this colour costs much less than ultramarine”.

In relation to the modern pigments, the analysed literature shows the availability of materials from the French supplier *Lefranc*. A collection of materials used by the painter Rafael Bordalo Pinheiro, dated from about 1920, in addition to *Lefranc*, shows the use of other brands, namely *Winsor & Newton*, *Morin & Janet* and *C. Bourguès* [36].

By the end of the 19<sup>th</sup> century, the references found show coexistence in Portugal of both modern pigments and traditional pigments that, while important in the previous centuries, meanwhile were dropped in other places. That coexistence, in general, has been observed by scientific analysis of Portuguese paintings [32-36].

The persistence of traditional pigments like azurite and smalt is uncommon, as they had an extremely reduced importance in the 19<sup>th</sup> century European paintings [37]. In addition to

the large delay associated with the adoption of the new pigments, this can be interpreted as a sign of traditionalism in a peripheral country.

## Conclusions

If technical literature may be regarded as indirect proof of introduction and knowledge about new materials, clear signs of persistence of traditional blue pigments throughout the entire 19<sup>th</sup> century were found. In relation to the pigments developed during this century, the first signs of innovation only appear, probably, in the mid 1840s and more consistently in the last quarter of the 19<sup>th</sup> century.

However, by the end of the century the main new blue pigments were known and international trade marks such as *Lefranc* were available for local painters. Consequently, new synthetic materials were at disposal of artists and incorporated into their practices. The results obtained suggest a more rapid circulation and adoption of new painting materials in the last decades of the century and show the appearance of a more specialized technical literature.

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