

PIXE analysis for the pigment identification in the Nizet manuscript (18th Century)



Mélanie Machowski¹, Helena Calvo del Castillo¹, Cécile Oger², Grégoire Chêne¹, David Strivay¹

¹ Centre Européen D'archéométrie – I.P.N.A.S. Université De Liège, Belgium.

² Bibliothèque Générale De Philosophie Et Lettres, Université De Liège, Belgium.

Contact email: mmachowski@doct.ulg.ac.be



INTRODUCTION

Written in 1740, the Nizet Manuscript is a heraldry book compiling the genealogy of the Nizet family (Verviers, Belgium). It presents a large number of hand-painted heraldries in traditional heraldic colours; the gold- and silver-like colours have undergone alteration and induced the degradation of the paper. The aims of the study of the manuscript were to identify the palette used and to explain the degradation phenomenon due to the metallic colours.

PRELIMINARY RESULTS

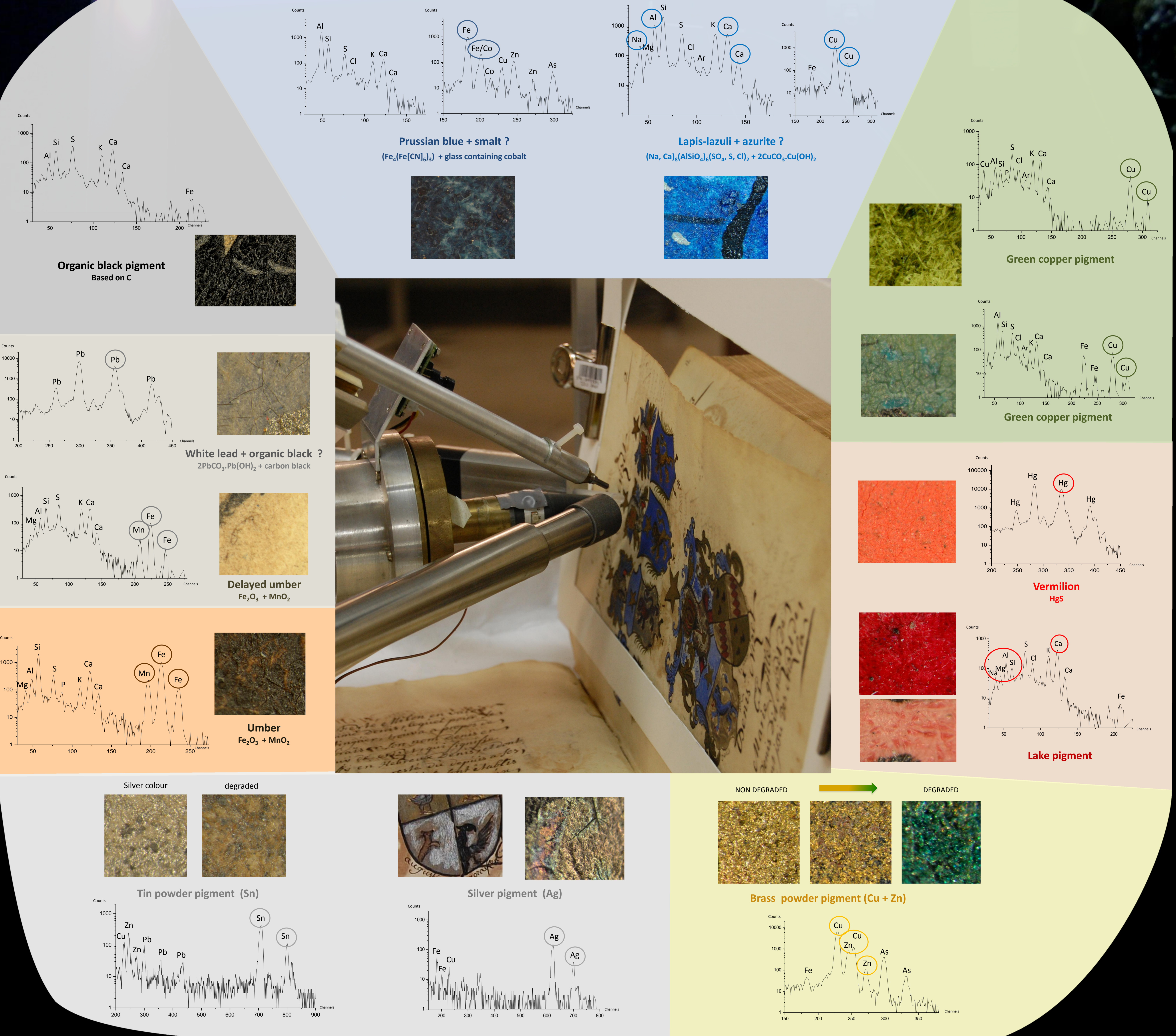
The Nizet manuscript has been first inspected with a binocular lens and UV-visible spectroscopy before doing PIXE analysis. The following colour groups have been distinguished after these preliminary analyses: blue (2 types of pigment), green (2 types of pigment), pink, brown, grey, black, gold-like pigment and silver-like pigment. These preliminary results have led to the selection of representative points to be studied by PIXE analysis: 77 points have been chosen among 27 pages of the manuscript to do qualitative and semi-quantitative analyses.

EXPERIMENTAL CONDITIONS

The PIXE measurements were performed with the cyclotron of the Institute of Nuclear and Atomic Physics and of Spectrometry of the University of Liège (Belgium). A new specific support has been designed to hold up the manuscript.

Experimental :

- 3.12 MeV proton beam with $i \leq 0.5\text{nA}$ and beam $\Phi = 0.8\text{mm}$
- Working distance = 13mm.
- 2 detectors, each at 40° to beam direction :
 - Si(Li) Sirius e2V detector (low energy) supplied with He flux
 - Ultra LEGe GUL0035P Canberra with 50µm Al absorber (high energy)
- Acquisition time : 15 min



CONCLUSIONS

Pigment identification

Some pigments have been clearly identified (vermillion, umber, brass-based, silver-based and tin-based pigments), while the others are still assumptions (lapis-lazuli + azurite, Prussian blue + cobalt, green copper pigments, red colorant, white lead, organic black pigment) and need some more investigations.

Pros and cons of the use of PIXE analysis for manuscripts

The study of the Nizet manuscript has shown there are some advantages and disadvantages in using PIXE analysis in the case of manuscripts:

- Pros : non-destructive, non-invasive, multi-elemental information, no sampling preparation, high sensitivity
- Cons : not suitable for organic pigments (light elements not detected), no molecular information, long acquisition time due to the necessity to use low current intensity to study manuscripts.

Future Work

In order to exactly identify all the pigments, Raman analyses need to be done to provide the complete pigment identification of the Nizet manuscript.