Pigment Identification of an Unknown Pigment Box

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Introduction

The pigment box, measuring 22 x 38 x 9.5 cm, is of wooden construction wrapped with leather. Inside is a three tiered removable tray system containing 99 pigments and 21 resins or solutions. The trays are lined with a blue felt.

It is presumed that the pigment box was brought to the program by Barbara Keyser prior to 2000. An entry entitled 'Barbara's pigments' appears in the lab notebook of Gus Shurvell in 2004. The name *Anthony Law* is associated with the notebook entry. Anthony Law (1916-1996) was a Naval Commander and WWII war painter. Whether or not the case belong to him, it is unlikely that he used the box as a functional paint box. The box functions more as a display of pigments rather than a utilitarian artist box.

A main concern with the pigment box is the possible presence of toxic pigments and an overall assessment was made to confirm this. Six pigments were identified and analysis for characterization (Figure XX). It was hoped that identification of the pigments could lead to a possible source of the box. The scientific methodology was kept straightforward and utilized instrumentation available to most conservators to create a simplified procedure for similar projects in the future.

Based on analysis toxic pigments were identified and protocols were suggested for future handling and storage of the box.

Figure 1. Pigment Case opened

Figure 2. details cork condition and variation in label legibility

Figure 3. All materials inside case. Blue circles denote pigments chosen for analysis

Experimental

XRF: an initial scan with the Bruker M6 Jetstream suggested the presence of several toxic heavy metals throughout the box. The six pigments chosen were analyzed using a Bruker Tracer 5g handheld XRF spectrometer through a polymeric film maintaining the pigment in their vials.

FTIR: a small sample of each of the six pigments was analyzed using FT-IR ATR and compared against existing databases of cultural heritage materials.

PLM: Polarized light microscopy was performed by taking the sample used for FTIR and mounting that to a slide using standardized methods described by McCrone 1982. PLM was most useful for the potential Emerald Green and Blue Verditer samples.

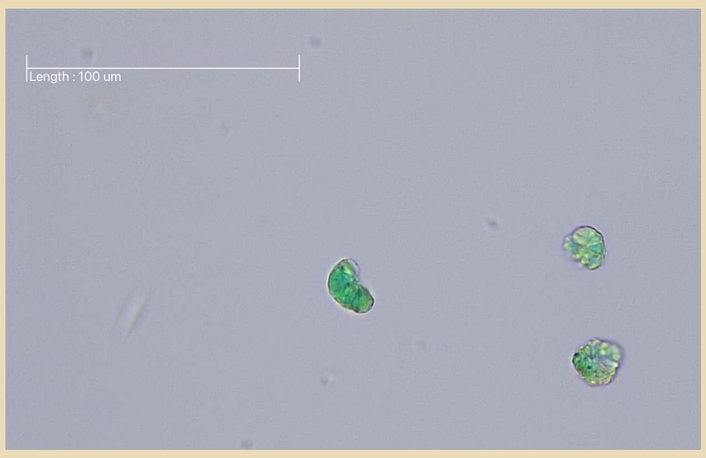

Figure 4. PLM image of potential emerald green

Results and Discussion

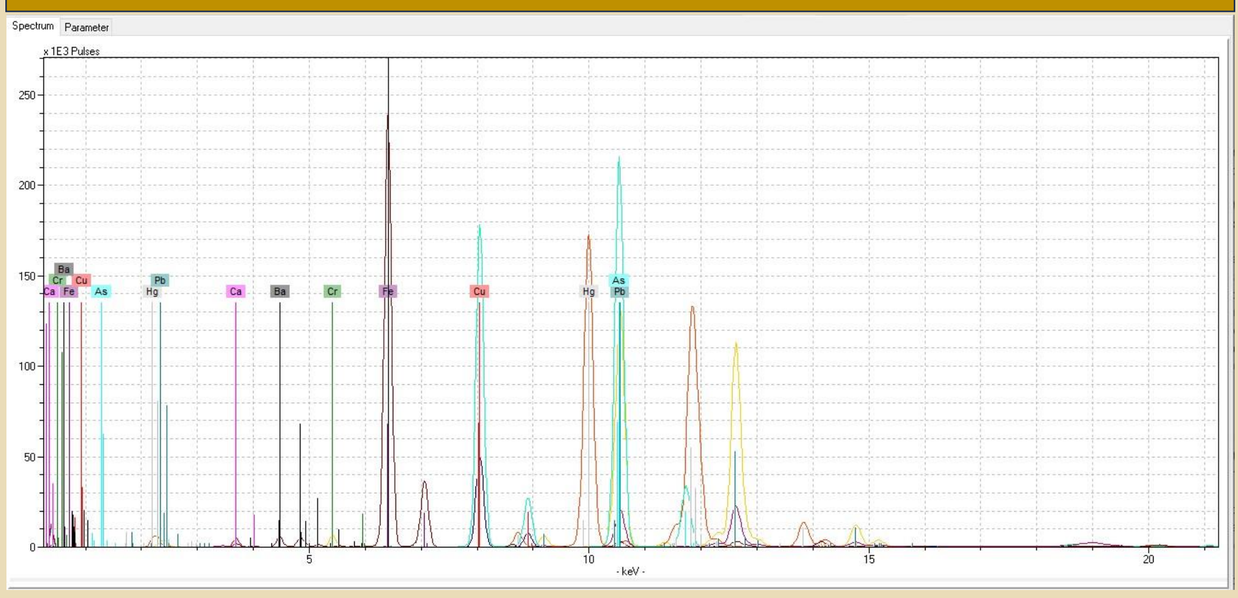

Figure 5. Combines XRF data for all six pigment samples

Elements that indicate toxicity identified with XRF: Arsenic, Mercury, Lead, Chromium, Copper

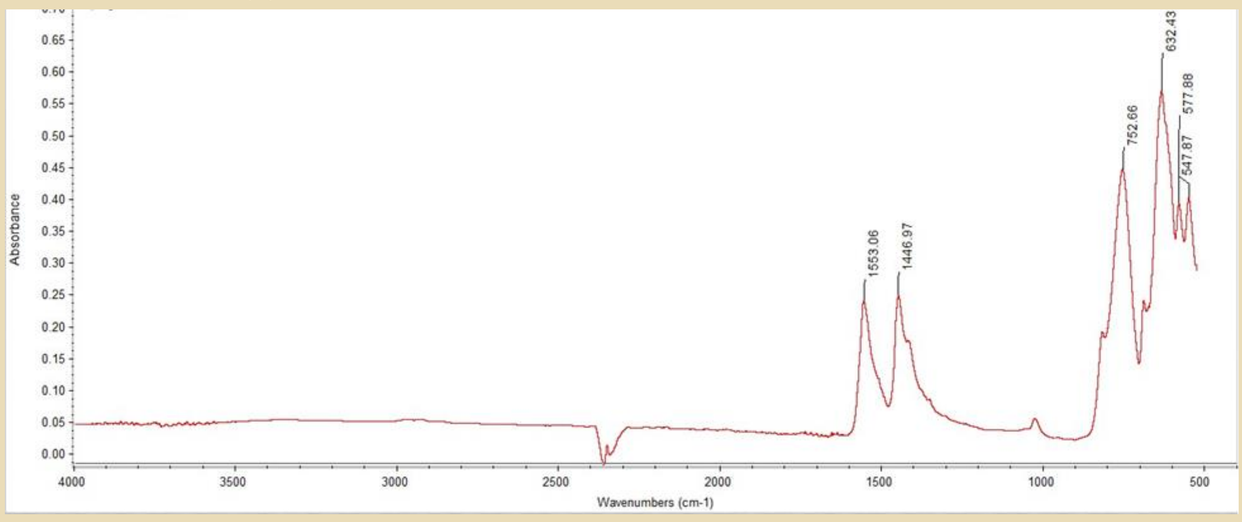

Figure 6. Example FTIR spectrum showing peaks characteristic of emerald green.

Results confirm the presence of toxic pigments. XRF, FTIR, and PLM identified the six pigments as: Blue verditer, chrome yellow, carmine (likely precipitated on a lead substrate), an iron earth red, vermillion, and emerald green. Based on small particle size, the manufacture of vermillion was determined to be via the wet process, which was initially reported in the 17th century, but was not widely utilized until the 19th century.

Figure 7. carmine, Indian red, blue verditer

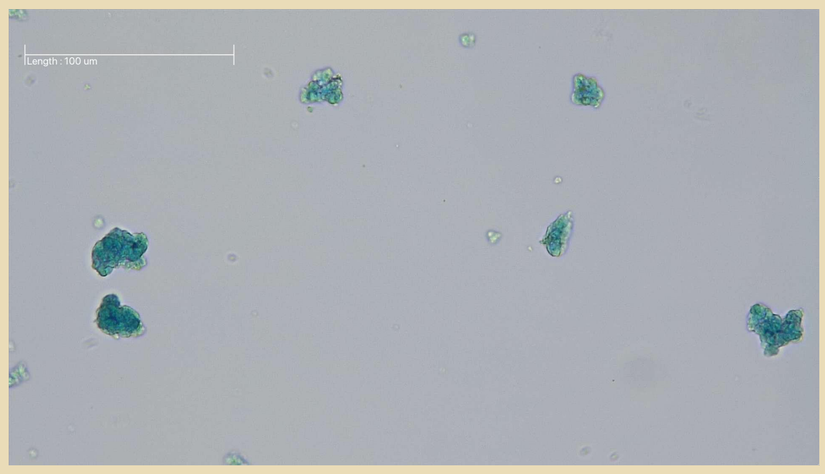

Figure 8. PLM image of potential blue verditer

Conclusions

Common scientific instrumentation was successfully used to characterize six pigments in an unidentified pigment box. Several toxic pigments were identified and there are likely many more. Using proper containment, the box needs to be isolated to limit unprotected exposure. The box must be labeled on the outside identifying the presence of toxic pigments. If a storage box is created to isolate the case, a photo of the contents should be included on the outside of the box and proper identification of item containing toxic materials. The contents should not be handled without PPE.

Vials labeled king's yellow and Dutch yellow were identified for further study. King's yellow is another name for orpiment, an arsenic based yellow pigment. It would be important to identify this as another toxic pigment in the case. Dutch yellow is interesting because the yellow lake pigment was known as Dutch pinke during much of its use. Further research into the name change could reveal more information about the maker or pigment supplier for this case.

References

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