TWO EARLY MEDIEVAL PARCHMENT MANUSCRIPTS – STUDY OF COMPONENT MATERIALS

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ABSTRACT

Within the Restoration-Conservation Centre for Cultural Heritage of Iasi two early medieval manuscripts on parchment (Tetra Evangel and The Greek Evangel) were investigated.

The restoring of these manuscripts gave the opportunity of a thorough research on the writing materials, pigments used in the ornamentation and the base material.

The study of the base material, carried out by IR spectrophotometry (Transmission and ATR), lead to the identification of a natural polypeptide (parchment) (specific bands at 1630 cm^{-1}- amide I and at 1530 cm^{-1} - amide II), and also of calcium carbonate (chalk), used as surface covering material.

Concerning the writing materials we identified ferro - gallic ink (The Greek Evangel), a mixture of ferro-gallic and carbon ink (Tetra Evangel – the first part), carbon ink (Tetra Evangel – the second part) and a cinnabar red ink (Tetra Evangel.

The decoration of both manuscripts (frontispieces, lateral bands, frames, miniatures) are of a large chromatic varieties. The pigments were identified by optical microscopy, micro chemical tests and XRF. The pigments determined are: gold (Au), iron oxides (Fe), cinnabar, malachite, transparent copper green, madder lake, lead carbonate (Pb).The phosphorus (S) identified may come from a protein (yolk), used as glue or protection layer.

The similarity of decoration materials points to the manufacture of both manuscripts in the same area of the Byzantine culture.

One manuscript (Tetra Evangel) was subjected to restoration, in order to stop and remove the physical, chemical and biological deteriorations (undulations, brittleness, chromatic alterations, pigments flaking). The restoration operations consisted in cleaning, dressing, flattening, voids infilling and pigments consolidation.

Within the Cultural Heritage Restoration – Conservation Center Iasy a lot of books or documents on parchment have been resorted. Among these two manuscripts "Tetra Evangel"- Romanian Literature Museum Iasy and "The Greek Evangel" – Central University Library Iasy are of a special significance.

The dating and origin of both manuscripts is a matter of dispute.

- The first manuscript is made up of two different parts, bind together. The first part has a rich and elaborated ornamentation (Figure 1), the second one - just red ink (Figure 2). The scholars consider the first part is written at the end of XI $^{-th}$ century, while the second part was added in the XIV $^{-th}$ century [4].

Figure 1

Figure 2

- The Greek Evangel, the most ancient musical manuscript in our country, is dated in the VIII – X^{-th} century[1]. The manuscript is written on a good quality, well processed parchment.

As the color, fineness and aspect of the manuscript files of The Greek Evangel gave rise to doubts about the nature of material, it was investigated by FTIR spectroscopy (Figure 3) [2]:

- a transmission spectrum was drawn for a white powder, sampled from the files surface
- an ATR spectrum was drawn for a sample of files material, after removing the powdery superficial white layer.

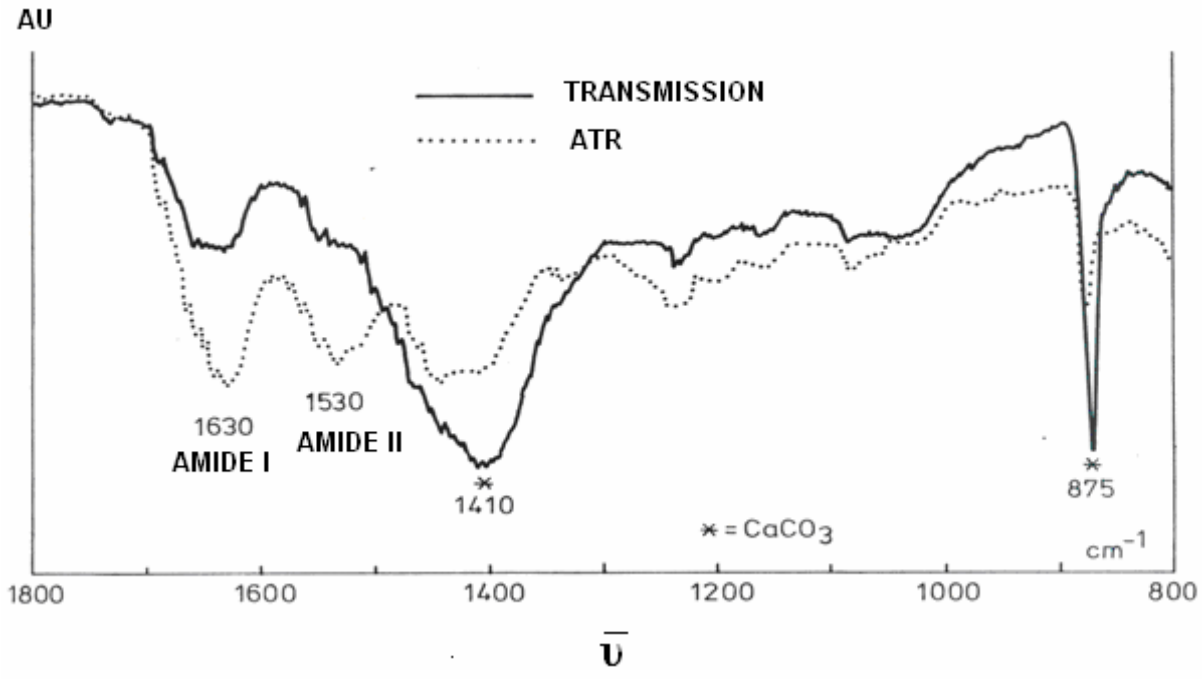

Figure 3

In the transmission spectrum the calcium carbonate - chalk was identified, with characteristic bands at 1410cm^{-1} and 875cm^{-1}.

In the ATR spectrum the specific bands at 1630cm^{-1} (amide I) and 1530cm^{-1} (amide II) were detected, pointing to a natural polypeptide – parchment.

The text was written with many types of ink [3]:

- Ferro Gallic ink – The Greek Evangel
- a mixture of Ferro Gallic and carbon ink - Tetra Evangel- first part (Figure 4)
- carbon ink - Tetra Evangel- second part
- cinnabar ink - Tetra Evangel- both parts (Figure 4)
- gold ink - Tetra Evangel- first part (Figure 4) and The Greek Evangel

Figure 4

The ornamentation of both manuscripts, consisting in capital letters, frontispieces, frames, borders, miniatures, shows a rich chromatic variety (Figure 5).

The pigment identification was carried out by the optical microscopy, micro chemical tests and micro-XRF) (Figure 6):

- The red-orange pigment, used for capital letters, miniatures and for the musical notation (The Greek Evangel) – cinnabar HgS (identified by OM and sodium azide iodine reagent test, specific for sulphides) [5]
- Other red pigments in both books – iron oxides (identified by potassium ferrocyanide test) and madder lake (Morine reagent test) [5]
- The white pigment – ceruse $2PbCO_3,Pb(OH)_2$ (identified by the KI reagent test[5] and by XRF)

- As for the green pigment, the malachite was identified in The Greek Evangel (dissolution test in HNO_3 and $(NH_4)_2[Hg(SCN)_4]$ reagent test and XRF) and the transparent copper green in Tetra Evangel (chemical test and XRF)
- The most relevant pigment was the blue, which was not a copper pigment, as it was expected, but natural ultramarine (negative chemical test for copper and the presence of S in XRF spectrum)
- The gold powder used in writing and ornamentation of both books was determined by XRF

Figure 5

The presence of such elements like S in XRF spectra seem to point to a protein, as egg white, used as binder or protective layer (Figure 6).

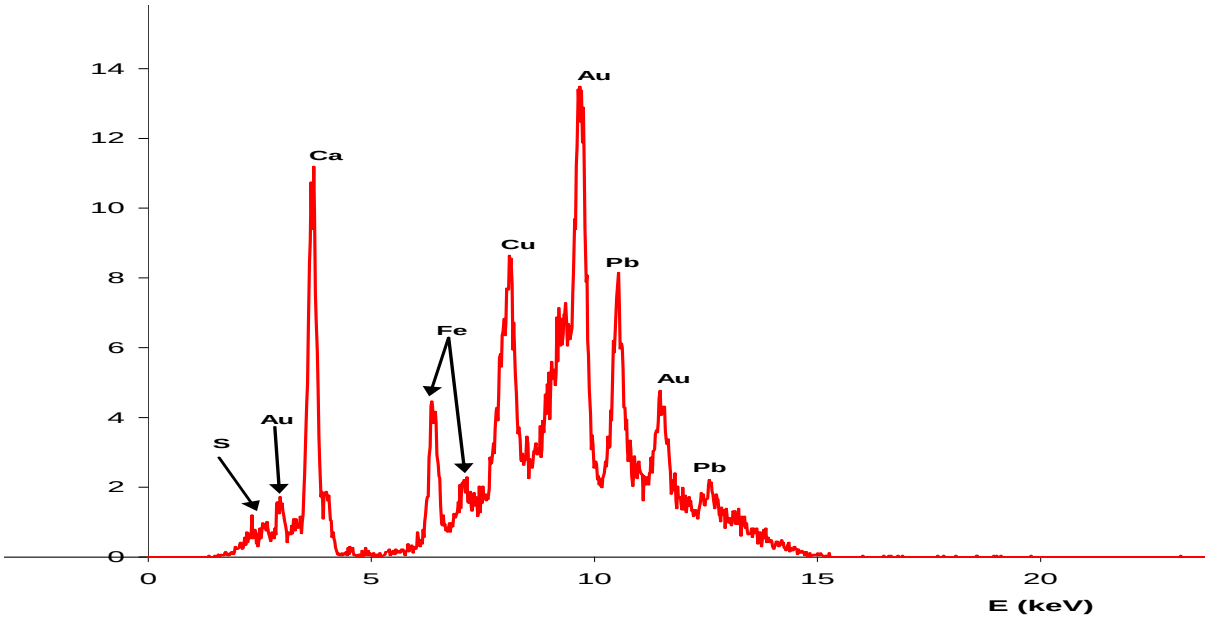

Figure 6

The similarity of the major part of pigments employed in the decoration of these two books is remarkable (Table 1).

This finding represents an argument for a common origin of both books in the geographical area of Byzantine culture.

Book	Ink	Pigments ornamentation					
		Red	Blue	Yellow	White	Green	Pink
Tetra Evangel XIth -XIVth c.	First part: – ferogallic +carbon – red ink – cinnaber - gold ink	- cinnaber -iron oxides -madder lake	- natural ultramarin	- gold powder	-ceruse	- transparent copper green	-madder lake + ceruse
	Second part: -carbon – red ink – cinnaber	-cinnaber	-	-	-	-	-
The Greek Evangel VIIIth - Xth c.	- ferogallic ink - gold ink	-cinnaber	- natural ultramarin	- gold powder	- ceruse	- malachite	-madder lake + ceruse

Table 1

The restoration of Tetra Evangel aimed at the consolidation of the parchment support and text, the conservation of the miniatures, giving back the initial aspect and re-establishing the adherence (Figure 7).

Figure 7

Due to excessive damp and microclimate changes the support became very fragile (1/2 of the book shows lacunae of the material and tearing), displaying also an important bacterial attack, resulting in intensively colored spots.

Other forms of decay are the parchment waving and rigidity, miniatures exfoliation, fissures, previous consolidating interventions with paper and parchment, wax spots and a functional patina.

The main restoration operations consisted in disinfection, cleaning and emolliating the parchment with isopropyl alcohol, reattaching the pigments using fish glue. The consolidation of the support in the fragile areas was done with Japanese paper and fish glue. Finally the lacunae were filled with conditioned parchment and fish glue.

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