

## RESEARCH AND INVESTIGATION OF ECCLESIAL HERITAGE BOOK-LEATHER COVER

NICOLETA VORNICU, CRISTINA BIBIRE

*Metropolitan Center of Research T.A.B.O.R, Metropolitanate of Moldavia and Bukovina  
Iasi, Romania, email: cmctaboriasi@yahoo.com*

This paper presents physic-chemical and biological investigation of the leather used in the manufacture covers to three books Antolghion, 1840, Minei 1845, Ceaslov 1874 from old book repository Library Dumitru Staniloaie. Techniques investigation used are: XRF, FTIR, electron microscopy and microscopie optics. The results provided information on the type of skin tanning type, nature and degree of biological attack and helped to establish the conservation status of these books, the active preservation and enhancement of existing in the exhibition.

Keywords: leather, book, cultural heritage

### INTRODUCTION

Conservation of heritage, the two sides of the: preservation and restoration, is a research complex, involving interdisciplinary. Elucidation of the mechanism of degradation of various organic and mineral materials in the structure of national heritage objects, explaining phenomena that occur over time between the systems involved in the processes of destruction and elimination or reduction of their activity is a fundamental issue of conservation and restoration.

The objects are subject progressive degradation processes due to the collaboration between several factors. Besides the natural process of aging, imminent any organic materials, suffered materials that make up objects of art have been some alterations complex physical, chemical and biological. Degradation of leather may be the result of sewing techniques, improper use or action of environmental conditions.

### OBJECTIVES

This paper presents physic-chemical and biological investigation of the leather used in making the covers of three books: Antolghion, 1840, Minei 1845 and Ceaslov 1874 from the old book store “Dumintru Staniloae” Library.



Figure 1. (a). Antolghion, brown leather (b). Mine, brown leather imprinted with gold leaf; (c). Ceaslov, brown leather

## **METHODS**

Investigative techniques used are: XRF, FTIR, electron microscopy and optical microscopy.

### **Optical Microscopy**

By examining with a microscope Olympus SZX 160 was made from the skin surface evaluation of the covers of the three books emphasizing mood garnet and shell follicle, which is the main parameter characterization to identify your skin type.

### **Scanning Electron Microscopy**

Scanning electron microscopy called (Scanning Electron Microscopy, SEM) is a technique for investigating high-resolution surfaces, whose application in the study of heritage objects are many and varied (Vornicu, Sturge). Analysis of skin samples taken from three items analyzed was performed using a scanning electron microscope (SEM / ESEM - EDAX) - Quanta 200 and followed highlighting skin morphology.

### **Analysis by X-ray Fluorescence Spectrometry Technique**

X-ray fluorescence spectral allows non-destructive elemental analysis of samples of old leather. Experimental determinations were made with an X-ray fluorescence spectrometer portable type Innov X Systems Alpha Series. It is equipped with an X-ray tube with a W anticathode, working at maximum parameters of 35kV and 40 $\mu$ A, fluorescence radiation is detected and analyzed with a Si detector (PIN) with thermoelectric cooling and operation is controlled by a minicomputer. For plotting spectra and semi-quantitative analysis software was used for light Soil matrix mode is selected during arousal from 60 sec.

### **FTIR Analysis**

FTIR analysis was carried out using a Vertex 70 Bruker, 30 – 25 000  $\text{cm}^{-1}$  FTIR spectrometer, KBr beamsplitter & RT-DLaTGS detector (mid-infrared), T222/3 multilayer beamsplitter & RT-DTGS-FIR detector.

Skin samples of skin powder and tablets were mixing potassium bromide (KBr). The resulted product was pressed in pellets with KBr.

## **RESULTS**

The results provided information on skin type, type of tanning, nature and extent of biological attack.

The preliminary optical microscopically investigation shows that the examined leather has the characteristics of the modified cow skin, due to the various degradations; the used method was the comparison of the stereo microscopically images with those of an whiteness sample. Scanning electron microscopy (SEM) is a method that is often used to investigate the skin, collagen, etc.

Biological degradation (Figure 2a) the books have musty areas which demand biological investigations although the active conservation of these books will be made by means of prevention and not by biological care.

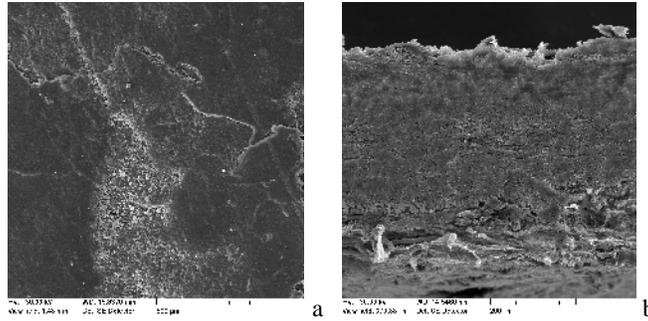


Figure 2. SEM image Antolghion: a. grain surface of dyed leather; b. SEM analysis of cross-section of dyed leather

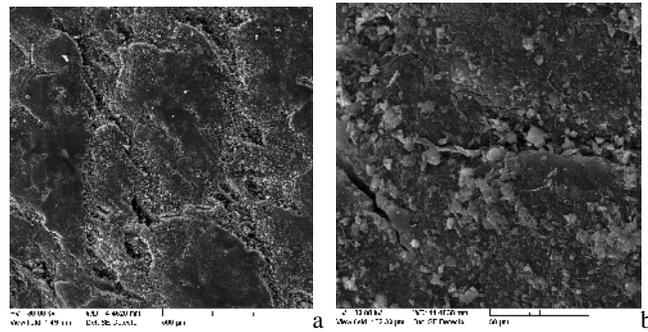


Figure 3. SEM image Minei: a. grain surface of dyed leather; b. SEM analysis of cross-section of dyed leather

Electron microscopy particles are easily recognized vegetable tannin (Figure 3b) leather in between collagen fibers sleeping network.

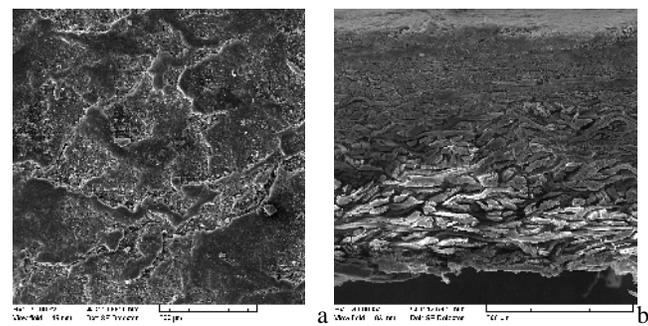


Figure 4. SEM image Ceaslov: a. grain surface of dyed leather; b. SEM analysis of cross-section of dyed leather

Electron microscopy performed at varying degrees of magnification confirms that the analyzed samples are cattle leather.

Cow reticular layer of skin is made of connective fiber bundles thick, strongly developed, intertwined, very irregular, with a natural boundary formed by braiding fibers to fine hypodermis. Calf skin, normally be considered as having histological structure of beef hides all small size. Samples analyzed with age and wear high degree of dehydration shows advanced morphology of the collapse.

However, if the 3 samples we can say that the skin was taken from an adult animal, as shown in the papillary layer (green). Both the macro observation and SEM images observed in this biological attack. Sampling was done by fingerprinting and cultivation was carried out on two types of media: Czapek-Dox agar for fungi and for bacteria. Identified the presence of active species and *Aspergillus niger* to Antolohion Ceaslov.

In order to identify the mineral composition of skin to cover the three objects used X-ray fluorescence is nondestructive This investigation and provide information about skin type but also how tanning. The results of registration for each type of sample spectra are shown in Figures 5, 6, 7 indicating the presence of elements Ca, K, S, Cu, Pb, Zn and Fe. which is due to skin composition (Ca, K) or remaining traces of processing stages.

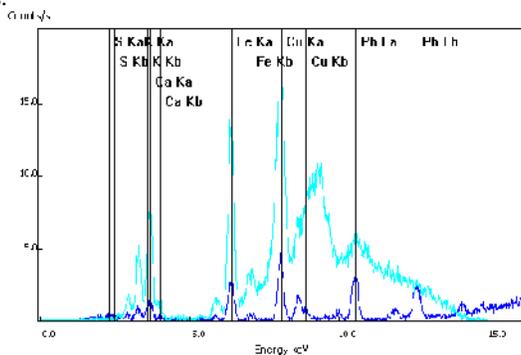


Figure 5. XRF spectrum for Antolohion

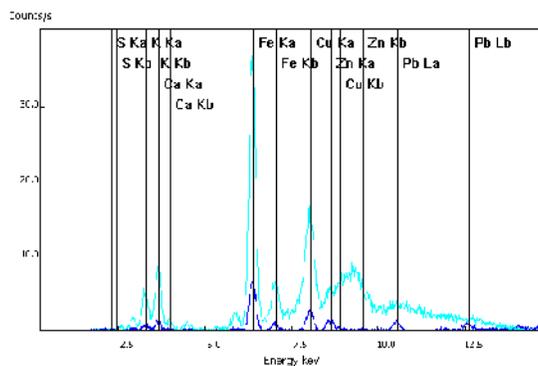


Figure 6. XRF spectrum for Minei

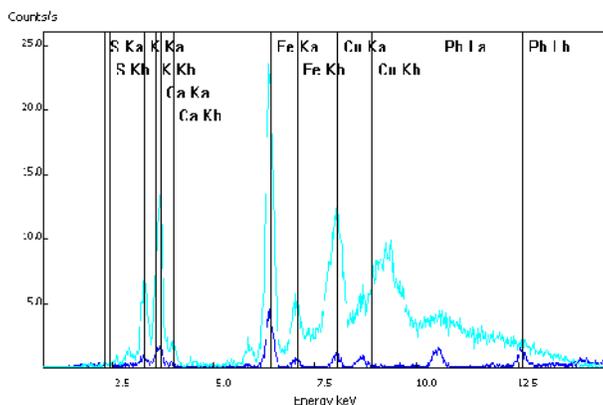


Figure 7. XRF spectrum for Ceaslov

Leather minerals varies depending on the breed, age and sex of the animal, from 0.25 to 0.65% on dry skin. Most of these substances is formed NaCl. The skin also contains phosphates, carbonates, sulfates, chlorides of K, Mg, Ca, Na, less Fe, Al, S (Larsen, 1994).

FTIR analysis was only performed in order to identify your skin type. Skin samples were scratched with a sterile scalpel blade obtaining a skin powder was mixed and compressed with potassium bromide (KBr). Was used as a standard sample powder from pig and goat skin. It was found that all spectra were almost the same as the skin is almost identical composition. Differentiation could be watching so called “regions of interest”, which are the following long wave and  $500-400\text{ cm}^{-1}$ ,  $1200-1000\text{ cm}^{-1}$  and  $700-600\text{ cm}^{-1}$ . (Elwathig). Following overlapping peaks for the three samples was noted that these spectra shows a bit visible in the region  $472-470\text{ cm}^{-1}$  indicating the highest molecular absorption for carbonyl functional group ( $-C = O$ ) and amide. This shows us that the covers are leather cow.

## CONCLUSIONS

The data obtained have helped to establish the conservation status of these books, the preservation and valuing active within the existing exhibition.

To identify characteristics of skin covers the three books we used optical microscopy electron microscopy showed that in all three cases it is the skin of cattle. Electron microscopy provided information on this biological attack Ceaslov and Antologhion, identification was achieved by specific laboratory techniques, signaling is the present species *Aspergillus niger* to Antologhion and Ceaslov. SEM image of particles present in vegetable tannin indicate vegetable tanning of the skin. It is obvious that type SEM analysis provides quantitative information and qualitative nature. Non-destructive XRF analysis by identifying elements expressed in ppm of skin covers the three provided information on the composition but also the type of tanning. If SEM analysis determined that cover skin for FTIR spectroscopic analysis objects determine the types of functional groups present in skin products confirming data previously obtained.

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Leather-Like. Pocket. Biblical Languages. Bible Reference. Biographies. Children's Books. Preschool (0-4).  
Ecclesiastes is a book rich in literary artistry and multi-layered depths of spiritual meaning. Philip G. Ryken explores this wonderful Old Testament book, and reminds us again of the need to trust God with the questions, even when we do not have all the answers. Table of Contents: Why Bother? The Ultimate Quest. Meaningful Hedonism. Working Things Out. All in Good Time. Tangible cultural heritage such as ruins or stone buildings needs special attention in terms of preservation and documentation (Jokilehto 1999). It has been noted previously that prior to any intervention and conservation, a detailed survey is needed to record architectural elements and materials used at the site (TÅrÅk and PÅ™ikryl 2010; PÅ™ikryl 2013, 2017).  
The total mapped area covered about 30 m2 of the existing wall surfaces (Theodoridou 2009).  
Regarding the importance of the presented research in relation with the conservation of the studied site, the in situ investigation provided an overview of the state of conservation of the stones of the Ruin Garden prior to the construction of a new roof system.