Cairo University
Faculty of Archaeology
Conservation Department

PHD thesis on

Experimental study on

The deterioration effect of invisible light on Archeological textile applied on selected objects

For the Fulfillment of PHD Degree on Conservation

Presented of

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Summary

The study consists of five chapters about the bad effect of invisible light on the Archaeological Textile applied on selected samples

Chapter one:

This part consist of two sections under title

"A study in identification of invisible light on Archaeological Textile"

Section one:

- shows the identification and nature of Infrared as one of the invisible light and its physical and chemical effects on dyed fiber (protein, cellulose fibers), treatment materials.
- shows the identification and nature of Ultraviolet rays on the physical and chemical deterioration of protein, cellulose fibers, natural dyes and treatment materials.
- Identification of Gamma rays and its bad effects on several materials. In addition to the interpretation of mechanism of deterioration.

Section two : shows the physical and chemical effects of IR and UV light on dyed textile, in this section the study indicated to the negative effects on protein, cellulosic fibers and natural dyes in the existence and absence of oxygen, and explains its role as a positive agent in damage process.

Section three: in this section the study focus of the bad effects of invisible light on polymers. And explain the mechanism of deterioration which resulting in fading and disappear the natural dyes.

Chapter two:

This part consist of two sections under title

"Modern scientific examination and analysis techniques for identification dyed fibers and its Damage"

***Section one*:** shows the modern examination methods for identification fibers, in addition to determine the degree of deterioration as a result of photo-degradation, and products of damage.

Section two: shows the scientific analysis methods used to explain the fading of dyes, and physical, chemical changes in natural dyes.

Chapter three:

This part consist of two sections under title

"The modern methods and techniques for treatment deterioration of light on archaeological textile"

***Section one*:** this chapter deals with the most scientific methods for treat the bad effects of invisible light on fibers and dyes by using specific materials and applied it to refresh the textile after light ageing.

Section two: show how we could protect the archaeological textile from damage by natural or artificial light into the museums. This section indicated to many designs for show case suitable for exhibition textile in saving and interesting way.

Chapter four:

This part consist of four sections under title

"Experimental studies in deterioration effects on the dyed woolen yarns"

Section one: in this section the study dyeing natural woolen yarns using two natural Dyes such as Madder and Cutch with the four common mordant used in dyeing bath: Alum, tin, Iron and Copper.

Section two: consisted of five experiments of artificial ageing applied on the samples prepared obviously:

- ageing the samples by artificial day light for 200 hours, and determined the rate of damage by several methods of examination and analysis.
- Ageing of dyed fiber using UV light for 200 hours. Then measuring the damage happens in fibers by using different types of microscopes, FTIR and color measurements.
- the woolen samples exposed to 1440 hours of IR rays for 1440 h. To illustrate the effect of this type of invisible light on fading of naturals dyes in the existence and absence of oxygen.
- the study deals with the chemicals treatment which applied on dyed woolen samples directly and indirectly.
- ageing samples after applying the chemical material exposed to 200 h of UV light to measure the effectiveness of these materials on the long run.

Chapter five:

This part consist of three sections under title

“Practical study on selected object of Applied Art museum”

***Section one*:** shows Artistic, historical and technical analysis of Moroccan Kilim which the study deals with from the collections of applied art museum, Helwan university. The study identified the object historically and geometrically. Furthermore illustrated the technique by

which the kilim is made, also the study indicated to the phenomena and mechanism of damage.

***Section two*:** shows scientific examination and analysis test applied on samples taking from the object. The study used several methods to determine the rate of damage:

- X-Ray Diffraction for knowing mordant existing in samples and compounds of dust and impurities residues on the surface of the samples.
- S.E.M using to clarify the fine details on the surface of samples taken from pieces of archeological textiles to identify the damage of fibers.
- FTIR analysis Identify the organic dyes used in textiles.
- Munsell test to determine the fading happen in the samples in numbers and hues.

Section three: the study shows the methodology of treatment; beginning with mechanical and chemical cleaning using brushes and wet cleaning using some suitable detergents. Then fixed the object on linen supported on wooden frame prepared for this purpose by needle works. Besides recorded every step by photos

Finally the study shows the results reached and gave some advices to restorers working in field.