

Chapter 10

Enzyme Immobilization Technology in Egyptian Historical Textile Conservation

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ABSTRACT

Ancient textiles can suffer from aging, deterioration, and events that deeply influence their original beauty and ethnological and economic value. The environmental conditions (temperature, humidity, light exposure, microbial contamination) that artifacts encounter during their lifetime strongly influence the value of the item, including those in the exhibition rooms of the museum, which are essential for proper preservation. Therefore, it was necessary to find an effective and safe method to clean these important archaeological materials. This method depends on enzymes, especially in their immobilized form, so that this method is economical, as the immobilized enzyme can be reused several consecutive times.

INTRODUCTION

Among the artworks, textile materials are important proofs of human history. Samples such as clothing, shrouds, upholstery, carpets, soldier's uniforms, ecclesiastical apparel, Olympic winning swimwear, and spacesuits make up a rich collection of precious antique fabrics but are also brittle, generally revealing a poor state of preservation.

Analysis of the causes of deterioration is of paramount importance for the protection of historic items and prevents further damage. However, recovery strategies are sometimes inevitable (Ferrari et al. 2017).

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The availability of rich historical textiles (figure 1) is evidence of international social history, trade, agricultural development, technical trends, and technological developments. For this reason, every effort should be made to preserve these textiles and pass them on to the next generation. The goal of any maintenance operations on textile items is to enhance the long-term stability of these textiles against wear and tear during operation, display, or in storage (Abdel-Kareem, 2005).

Figure 1. Historical textiles

<https://www.cairo360.com/article/artsculture/theEgyptiantextilemuseumhistoryofEgyptthroughfabrics/>



Textile preservation science is an interdisciplinary science that includes various branches of science such as biology, chemistry, humanities, physics, history, applied arts, etc. To succeed in the preservation of antique textiles, it is necessary to follow all the developments in these branches of science and to make use of all these developments in the textile field of preservation (Ahmed, 2009; Schweppe, 1984). Nowadays, there are advanced developments in all these sciences. The decision to choose any preservation operation for historical textile objects must be based on a compromise between evidence preservation and long-term promotion that preserves the constituent materials of the object (Abdel-Kareem and Schoefer, 2011).

There are many different types of antique textiles, including cotton, silk, linen, and wool. Wool, an example of antique textiles (figure 2), was used to cover the human body in ancient times when man used the animal skins he hunted and then learned how to remove the hair and weave it to make clothes. Explorations indicated that the first person was familiar with wool spinning operations and its fabrics, as the ancient Egyptians and Greeks used to spin and weave inside their homes (Lucas and Harris, 1964).

The Romans excelled in making thick and fine woolen fabrics. In the Middle Ages, the wool industry flourished. In Italy, New Zealand, Belgium, and Spain, where merino sheep are bred, the wool is one of the finest because it is characterized by great precision. Sheep are raised in Arab countries for their meat, fibers, and wool; the wool of these sheep is coarse and used in the production of carpets and rugs (Snell, 2020).

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