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Restoration and Conservation of Historical Textiles Using Covalently Immobilized Enzymes on Nanoparticles

Authors : Mohamed Elbehery

Abstract : Historical textiles in the burial environment or in museums are exposed to many types of stains and dirt that are associated with historical textiles by multiple chemical bonds that cause damage to historical textiles. The cleaning process must be carried out with great care, with no irreversible damage, and sediments removed without affecting the original material of the surface being cleaned. Science and technology continue to provide innovative systems in the bio-cleaning process (using pure enzymes) of historical textiles and artistic surfaces. Lipase and α-amylase were immobilized on nanoparticles of alginate/κ-carrageenan nanoparticle complex and used in historical textiles cleaning. Preparation of nanoparticles, activation, and enzymes immobilization were characterized. Optimization of loading time and units of the two enzymes were done. It was found that, the optimum time and units of amylase were 4 hrs and 25U, respectively. While, the optimum time and units of lipase were 3 hrs and 15U, respectively. The methods used to examine the fibers using a scanning electron microscope equipped with an X-ray energy dispersal unit: SEM with EDX unit.

Keywords : nanoparticles, enzymes, immobilization, textiles
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