

Synthesis and Characterization of Heterogeneous Silver Nanoparticles for Protection of Ancient Egyptian Artifacts from Microbial Deterioration

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Abstract : Biodeterioration of cultural heritage is a complex process which is caused by the interaction of many physical, chemical and biological agents; the growth of microorganisms can cause staining, cracking, powdering, disfigurement and displacement of monuments material, which leads to the permanent loss of monuments material. Organisms causing biodeterioration on monuments have usually been controlled by chemical products (biocides). In order to overcome the impact of biocides on the environment, human health and monument substrates, alternative tools such as antimicrobial agents from natural products can be used for monuments conservation and protection. The problem is how to formulate antibacterial agents with high efficiency and low toxicity. Various types of biodegradable metal nanoparticles (MNPs) have many applications in plant extract delivery. So, Nano-encapsulation of metal and natural antimicrobial agents using polymers such as chitosan increases their efficacy, specificity and targeting ability. Green synthesis and characterization of metal nanoparticles such as silver with natural products extracted from some plants having antimicrobial properties, using the ecofriendly method one pot synthesis. Encapsulation of the new synthesized mixture using some biopolymers such as chitosan nanoparticles. The dispersions and homogeneity of the antimicrobial heterogeneous metal nanoparticles encapsulated by biopolymers will be characterized and confirmed by Fourier Transform Infrared Spectroscopy (FTIR), Transmission Electron Microscopy (TEM), Scanning Electron Microscopy (SEM) and Zeta seizer. The effect of the antimicrobial biopolymer metal nano-formulations on normal human cell lines will be investigated to evaluate the environmental safety of these formulations. The antimicrobial toxic activity of the biopolymeric antimicrobial metal nanoparticles formulations will be will be investigated to evaluate their efficiency towards different pathogenic bacteria and fungi.

Keywords : antimicrobial, biodeterioration, chitosan, cultural heritage, silver

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