

Nanosilver Containing Biodegradable Bionanocomposites for Antimicrobial Application: Design, Preparation and Study

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Abstract : Surgical device-associated infection and biofilm formation are some of the major problems in biomedicine for today. The losing protection ability of conventional antimicrobial-drugs leads to the challenges in the current antibiotic therapy, the most serious of which is antibiotic resistance. Our strategy to overcome the biofilm formation consists in coating devices with polymeric film containing nanosilver(AgNPs) as a bactericidal agent. Such bionanocomposites are also promising as wound dressing materials. For this purpose, we have developed a new generation of AgNPs containing polymeric composites in which amino acid based biodegradable poly(ester amide)s (PEAs) were served as both matrices and AgNPs stabilizers. The AgNPs were formed by photochemical (daylight) reduction of AgNO₃ in ethanol solution. The formation of AgNPs was monitored by coloring the solution in brownish-red and appearance of the absorption maximum at 420-430 nm in UV spectrum. Comparative studies of PEAs with polyvinylpyrrolidone (PVP) as particle stabilizers were carried out. It was found that PVP is better stabilizer in terms of particles yield and stability. Therefore, in subsequent experiments blends of PEAs and PVP were used as stabilizers for fabricating AgNPs. As expected, PVP increased the stabilizing effect and this apparently observed in the UV spectrum of the samples after 7 h daylight irradiation: for pure PVP $\lambda_{\text{max}} = 430 \text{ nm}$, $D = 2.03$, for pure PEA $\lambda_{\text{max}} = 420 \text{ nm}$, $D = 0.65$, and for the blend of PVP and PEA $\lambda_{\text{max}} = 435 \text{ nm}$, $D = 1.88$. Further study of the obtained nanobiocomposites is in progress now.

Keywords : biodegradation, bionanocompositions, polymer, nanosilver

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