Nano Silver Impregnated Polymer Coating for Food Packaging: Preparation, Applications, and Characterization

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Abstract

The ever growing demand for fresh food requires a packing that can extend the shelf life of food and capable of protecting it from contaminations that could leads to foodborne diseases. Silver nanoparticles exhibits very strong antimicrobial properties in variety of environmental conditions. Nowadays, there is a lot of attention in designing effective antibacterial material for food packing. Silver nanoparticles (AgNPs) based antimicrobial packaging is an innovative form of food packaging that extends the shelf-life of food and reduce the risk of pathogens. AgNPs are one of the most powerful inorganic antimicrobial agents known. The present research work describes the preparation of silver nanoparticles, their incorporation into cross-linked polyvinyl alcohol coating and the antibacterial activity of the coating. For every coating technology the adhesion is known to be critical. In general, factors that affect coating adhesion are mainly determined by the interfacial phenomena between the coating and the substrate. In this study, polymer substrates were activated by a controlled UV treatment. Contact angle measurements were used to measure the degree of activation. The work of adhesion was used as a measure of adhesion and was measured by employing peel off test. Optimum UV dose was determined by considering the degree of activation and work of adhesion. Thermogravimetric analysis was employed to study the thermal degradation of cross-linked nanosilver coating. Nanoparticles were characterized by Surface Plasmon Resonance (SPR) spectrums and Scanning Electron Micrographs (SEMs). The zone inhibition method was employed together with bacteria Escherichia coli to assess biocidal action. The developed product showed significant antimicrobial properties.