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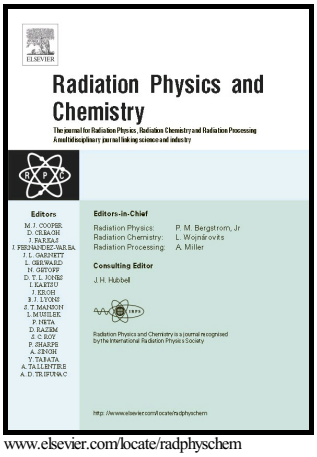

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Preparation and characterization of gamma irradiated Starch/PVA/ZnO nanocomposite films

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Abstract

In this study starch/PVA/ZnO nanocomposite films with antibacterial activity were prepared and modified using gamma irradiation for packaging applications. ZnO nanoparticles (NPs) were synthesized from $Zn(OH)_2$ using hydrothermal process and characterized by X-ray diffraction (XRD) and scanning electron microscopy (SEM). The prepared ZnO NPs were incorporated into blend films of starch and poly (vinyl alcohol) (PVA) with different concentrations from 0.1 to 1 wt% using solution casting method. The results of SEM confirmed good dispersion of ZnO NPs into the films while FTIR spectroscopy showed interactions between ZnO particles and starch/PVA blend. The nanocomposite films were irradiated at the dose range of 1 to 5 kGy. It was found that gamma irradiation induces a significant reduction in water absorptions of the films at the dose of 3 kGy. Different trends were observed for the tensile and elongation properties of the irradiated films. Based on the results, the bacterial growth on the films was effectively inhibited when the dosage of ZnO NPs was only 0.5 wt%.

Keywords: Starch/PVA/ZnO, Nanocomposite, Gamma irradiation, Antibacterial.

1. Introduction

The use of biodegradable polymers for packaging applications suggests a partial solution to the environmental problems caused by synthetic inert polymers [Siracusaa et al., 2008]. Starch is one of the most studied and favorable raw materials for the production of biodegradable plastics. Starch is an abundant, biodegradable, inexpensive and renewable material [Whistler and BeMiller, 1984]. However, its wide applications have been limited due to the lack of water resistibility, processability, and poor mechanical properties. To