Improvement of Physico-Mechanical, Thermomechanical, Thermal and Degradation Properties of PCL/Gelatin Biocomposites: Effect of Gamma Radiation

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ABSTRACT

This research was to study the effects of gelatin content variation and gamma radiation after the 2-ethylhexyl acrylate (EHA) pre-treatment on the foundamental properties of gelatin film laminated polycaprolactone (PCL) biocomposites. PCL/gelatin film (PCL/GF) composites were fabricated by compression molding and their properties were studied by physico-mechanical, thermomechanical, thermal and degradation properties. The results from mechanical properties such as tensile modulus and impact strength of the composites increased with increasing of gelatin content up to 10 wt% and then decreased while the tensile strength and elongation at break decreased. EHA monomer (2–8 wt%) was added to the gelatin solution and films were prepared by casting and found to increase the mechanical properties of the PCL/EHA blended gelatin film (PCL/EGF) composites. Treatment of the gelatin film with gamma radiation after the EHA pre-treatment showed the best mechanical properties of the resulting composites. Dynamic mechanical thermal analysis results showed that the storage modulus of the PCL/EGF and PCL/EHA blended gelatin film with gamma radiation (PCL/GEGF) composites was increased significantly. The degradation properties in water and soil were determined for the non-irradiated and irradiated composites. It was observed that the non-irradiated composite degrades more than that of the irradiated composites.

KEYWORDS : Gelatin; Polycaprolactone; Bio-composites; Gamma radiation; Mechanical properties

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