

Radiation induced synthesis of (gelatin-co-PVA)-g-poly (AAc) copolymer as wound dressing material

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Abstract. Copolymers of gelatin and poly (vinyl alcohol), (PVA) grafted by acrylic acid (AAc) with excellent water absorption and retention abilities under neutral conditions were successfully synthesized using ⁶⁰Co gamma radiations in presence of ammonium persulphate (APS), as water soluble initiator and sodium bicarbonate (NaHCO₃) as foaming agent. The optimum synthesis conditions pertaining to maximum swelling percentage were evaluated as a function of gelatin/PVA ratio, amount of water, concentration of APS, NaHCO₃, monomer concentration and total irradiation dose. Maximum percent swelling (1694.59%) of the copolymer, gelatin-co-PVA, was obtained at optimum [APS] = 2.92×10⁻¹ mol/L, [NaHCO₃] = 7.94×10⁻² mol/L and 1.5 mL of water at total dose of 31.104 kGy while in case of grafted copolymer, (gelatin-co-PVA)-g-poly(AAc), maximum percent swelling (560.86%) was obtained using 8.014×10⁻¹ mol/L of AAc in 9 mL water with 31.104 kGy preirradiation dose. The pristine and grafted copolymers were characterized by Fourier Transform Infrared Spectroscopy (FTIR), Scanning electron Microscopy (SEM), Thermal gravimetric analysis (TGA) and X-Ray Diffraction (XRD) methods. The copolymers loaded with an antiseptic, Povidone, were used as wound dressing materials for wounded gastrocnemius muscle of mice and the results exhibit that (gelatin-co-PVA)-g-poly (AAc) copolymer is a potent wound dressing material as compared to the copolymer.

Keywords: PVA; gelatin; acrylic acid; gamma ray irradiation; APS, sodium bicarbonate

1. Introduction

Hydrogels are 3-dimensional cross-linked polymeric networks with excellent hydrophilic properties and are used in various biomedical applications. They swell to a considerable extent in aqueous medium without being dissolved at physiological temperature and pH. They can be used as reliable polymeric scaffolds to provide structural integrity to tissue constructs and as drug delivery devices and protein delivery systems to tissues and cultures. They can also serve as bonding agent or barriers between tissue and material surfaces and, thus, are worthy to be explored as biomaterials.

Poly (vinyl alcohol) (PVA), a synthetic polymer, has hydrophilic nature, good biocompatibility, and a consistency similar to that of soft tissue and has desirable physical properties such as

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