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Effect of PEG on mechanical and water absorption properties of the PVP/Carageenan hydrogel wound dressing

S S Kulatunge*, K R C De. Silva, R M M Ranaweera and J T S Motha

Atomic Energy Authority, No 60/460, Baseline Road, Orugodawatte, Wellampitiya

Hydrogels, which consist of natural polymers or their composites with synthetic polymers, produced by irradiation technique have been under the attention of researchers due to their biodegradability and availability at low cost. The combination of natural and synthetic polymers can give better properties for wound dressing. However, water absorption by the hydrogel is still inadequate. Hence our study was aimed to enhance water absorption by the hydrogel film which is an important property when applying it as a wound dressing, while maintaining the substantial mechanical properties of the film. Hydrogel polymers were prepared using poly(vinylpyrrolidone) (PVP) as the synthetic polymer and carageenan as the natural polymer together with poly(ethylene glycol) (PEG) by gamma radiation at the absorb dose of 12 kGy. Concentration of commercial grade PEG was optimized as 2.5% to achieve maximum water absorption by the hydrogel film. Then the effect of different molecular weight PEG ranging from 190 to 4500 Da, at the concentration of 2.5%, on water absorption of the PVP/Carageenan hydrogel films prepared and sterilized by radiation crosslinking were studied. Water absorption was measured as a percentage of the swollen gel mass to that of the initial wet mass of hydrogel at the equilibrium swelling of the film at 37^{0}C and humidity of 80%.

The results indicated that the PEG 400 was the most suitable in formulation of PVP/Carageenan hydrogel having water absorption more than 2000 % together with 500 g/cm^2 tensile strength which is satisfactory in handling the films for medical applications such as wound dressing. It was also noted that the absorption of water by the hydrogel film saturates after about 08 hrs. The properties of the hydrogel films such as tensile strength, elongation at break% were also determined and the results showed that the above properties were in an acceptable range of values for mechanical protection of the film during the handling.

samantha@aea.ac.lk Tel : 0777414016