BIODEGRADABLE PVA-G-POLY(AA-CO-AMPS)HYDROGEL AS PROMMISING MATERIALS FOR PROTEIN ADSORPTION AND DRUG DELIVERY

HOCINE Salima [1*], GHEMATI Djamila [1], ALIOUCHE Djamel [1]

[1]*Laboratory of Polymers Treatment and Forming, F.T .M'Hamed Bougara University, Boumerdes 35000, Algeria.*

Code CCO13

Email* : s.hocine@uiv-boumerdes.dz

Introduction & Objectives:

Hydrogels are well known as physically or chemically cross-linked hydrophilic polymers with 3-dimensional network structures which are capable to retain large amounts of water or biological fluids without dissolving [1,2]. Owning to these properties, recently, they have attracted much attention from many researchers in several fields such as drug-delivery system, wastewater treatment and agriculture [2-3].Polyvinyl alcohol (PVA) is a cheap, biocompatible, nontoxic, and water-soluble polymer. Due to its ease of film formation, water solubility, chemical stability, complete biodegradability, gel forming, and physical properties .[4 ,5]Pure PVA hydrogels are not sensitive to environmental stimuli,therefore, it needs to combine the advantages of PVA with an other polymers to produce a new kind of material.One of the best methods for the synthesis of these materials is chemical grafting of vinylic monomers such as 2-Acrylamido-2-Methylpropane Sulfonic Acid and acrylic acid. Moreover, , graft copolymerization is a technique, which improves the properties of natural and synthetic polymers and gives them a new property. On grafting the host polymer gains some of the desired properties of the monomer used for grafting. [6] Overall, hydrogels derived from AMPS and AA exhibit pH-dependent swelling behavior.The aim of the present work was to investigate the synthesis of PVA-g-poly (AA-Co-AMPS) hydogel through free radical graft polymérization.in thir work the degradation test of synthesized PVA-g-poly(AA-CO-AMPS) hydrogel was conducted under simulated physiological condition using pepsine,trypcine and poncreatine us enzymes.Bovine serum albumine BSA was selected as model drug to test the in vitro release behavior of the hydrogel.

Methodology (Material and methods):

In this study hydrogels of Polyvinyl alcoho-g-acrylic-2-acrylamido-2-methyl-1-propanesulfonic acid were synthesized by graft copolymerization.BSA was chosen for use as a model protein drug to evaluate the controlled release properties of pH responsive hydrogels synthesized.Swelling behavior in distilled water, in physiological saline and in bovine serum albumin (BSA) solutions was studied. Influence of initial BSA concentration and pH on hydrogel swelling was investigated.Loading of BSA onto the hydrogel was studied using aswelling–diffusion method Release profiles of model protein from drug loaded hydrogel were studied in distilled water at pH 1.2buffer (simulated gastric fluid) and pH 7.4 buffer (simulated intestinal fluid).

Results and Discussion:

The different kinetic models such aszero order, first order, Higuchi, Korsmeyer–Peppas and Hixson–Crowell were applied and it has been observed that release profile of BSA best followed the Hixson–Crowell for the release of drug in all release media, However,first order and Krosmeyer-peppas models onely for pH 1.2 and pH7.4. In summary, the swelling of the

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hydrogels and release of drug from the drug loaded hydrogels occurred through non-Fickian diffusion mechanism.

Conclusion :

BSA adsorption onto hydrogels mainly depends on the swelling behavior of the hydrogel; higher swelling degree suggests larger amount of BSA adsorbed. So, the swellingand release of drug occurred through non-Fickian diffusion mechanism. It has been found that the hydrogel with high drug loading efficiency displayed faster and higher release rate than that of hydrogel containing a smaller amount of drug. Also, PVA g-(AA-AMPS) hydrogel gives a better release rate than (PVA –AA) hydrogel. Therefore the AMPS play an important role in the release mechanism of BSA, and the best release medium is gastric pH=1.2.

The release kinetics of the prepared systems followed Hixson–Crowell kinetic. The aim of the present work is to add a pH sensitive hydrogel with better performance to the wide range of biomaterials available for controlled drug release.

Keywords: Proteine, hydrogel, biodegradability, drug dilevery, adsorption.

References

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