Synthesis and Characterization of Hydrogel CMC/PVA, AC/PVA and TMSC/PAAm Using Catalyst Inorganic

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Introduction
New blend hydrogels based on carboxymethylcellulose (CMC) with poly(vinyl alcohol) (PVA), cellulose acetate (AC) with PVA, and trimethylsilyl cellulose (TMSC) with polyacrylamide (PAAm) were prepared by crosslinking in an aqueous solution with glutaraldehyde (GA) in the presence of catalyst inorganic (HCl for PVA and Potassium Persulphate “K_2S_2O_8” for AAm). The state of the miscibility of the blend hydrogel films was examined over the entire composition range by differential scanning calorimetry (DSC) and scanning electron microscopy (SEM). Hydrogels are hydrophilic three–dimensional networks that possess the ability to swell in aqueous system without solution. Hydrogels have done release drugs possible due theirs “hydrophilic matrix” that when are put into aqueous environment or on the surface contact like skin, they have a lot swelling capacity due to hydrophilicity while the hydrophobic part probably will retain the drugs.

Results and discussion
Synthesis of hydrogel was prepared by dissolving polymer powders in solvent and by heating at 55°C (AAm) and 80ºC (PVA) with stirring. GA and catalyst inorganic (HCl or K_2S_2O_8) were added such chemical crosslinker agent and initiator, respectively. The polymeric blend was carried out at 55°C by 22 hours using AAm and at 80°C by 30 minutes using PVA. The blend was pored in a petri-dishes and drying for two days at room temperature. This films formed were cured two days at 60ºC to eliminate probably moisture. The catalyst inorganic will dependent of each hydrogel in the reaction system.

The samples were characterized by means Fourier Transformed Infrared Spectroscopy (FTIR, DSC and SEM. The IR spectrums shows the characteristic stretching absorption at 1670–1640 cm⁻¹ of the C=O group that belong to PAAm. Symmetric and asymmetric deformations of Si–CH₃ bonds about TMSC were find at 1250-1470 cm⁻¹ and 1400-1410 cm⁻¹ respectively. DSC curves were observed two glass transition temperatures (Tg) at –4ºC and 166ºC belongs to TMSC and PAAm respectively. The hydrogel elaborated with CMC/PVA and AC/PVA shown a Tg between 7–9ºC. The swelling evaluated in terms of the amount of water up-take, increased with increasing concentrations of the crosslinker and catalyst.

SEM images were obtained to characterize the surface of the TMSC/PVA, CMC/PVA and AC/PVA hydrogel films. This hydrogel films samples in dried hydrogel were prepared, and the SEM images are shown in the Fig. 1.
Fig. 1. SEM images of hydrogel films. Surface (a) CMC/PVA 1:3, (b) AC/PVA 3:5, (c) TMSC/PAAm 1:4 and (d) TMSC/PAAm 1:1

Fig. 1 shows the surface of CMC/PVA, AC/PVA and TMSC/PAAm respectively, of dried hydrogels films. The flat and featureless images indicate that the films have a condensed structure and clearly show the appearance of a porous structure. The conclusion is that CMC, AC and PVA and their blends were chemically crosslinked with GA in the presence of HCl as catalyst in an aqueous solution state. TMSC and PAAm and their blends were chemically crosslinked with GA in the presence of K$_2$S$_2$O$_8$ as catalyst.

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Reference