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SYNTHESIS, CHARACTERIZATION, SWELLING KINETICS AND MECHANISM OF CHITOSAN-STARCH HYDROGELS AND THEIR CROSS-LINKED COUNTERPARTS AS POTENTIAL DRUG RELEASE AND TISSUE ENGINEERING SYSTEMS

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Chitosan was prepared from snail shells and modified by blending with starch to obtain hydrogels with chitosan-starch ratios of 3:1, 2:1 and 1:1. These materials were crosslinked with varying amounts of glutaraldehyde to achieve different crosslink densities (CDs) between 0.65 and 2.00. The results obtained from the FTIR studies on the hydrogels showed a strong O-H stretching band at 3424 cm^{-1}, attributed to the cumulative -OH groups of starch and chitosan at 1740 cm^{-1}, corresponding to amide C=O stretching vibration, indicative of an incomplete deacetylation of the acetyl group in chitin. The swellability studies showed that the extent of swelling of the hydrogels increased as CD and time increased and as pH decreased. Blending chitosan with starch also increased swelling as the amount of starch increased because of the numerous -OH groups in starch, which enhanced the hydrophilicity of the hydrogels. Uncross linked 3:1 chitosan-starch hydrogel had maximum swelling of 281.60%, while that for 2:1 and 1:1 chitosan-starch hydrogels were 253.26% and 138.08%, respectively in highly acidic medium (pH 2), suggesting that the hydrogels can be used as drug release systems in this medium. In all cases, their crosslinked counterparts had decreased swellabilities suggesting that, the crosslinked chitosan-starch hydrogels can be used for a more controlled drug delivery and as efficient materials for tissue engineering. The swelling of the hydrogels followed second-order kinetics and their swelling diffusion exponents ranged from 0.181 to 0.659, indicative of less-Fickian diffusion

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