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Superabsorbency, pH-Sensitivity and Swelling Kinetics of Partially Hydrolyzed Chitosan-g-poly (Acrylamide) Hydrogels

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Abstract: Acrylamide (AAm) monomer was directly grafted onto chitosan using ammonium persulfate (APS) as an initiator and methylenebisacrylamide (MBA) as a crosslinking agent under an inert atmosphere. Two factors affecting the swelling capacity of the obtained hydrogel, AAm and MBA concentrations, were studied. The polymer structures were characterized by FTIR spectroscopy. Water absorbencies of the hydrogels were compared between before and after the alkaline hydrolysis treatment. Saponification of chitosan-g-poly(acrylamide) (chitosan-g-PAAm) with a hot sodium hydroxide solution gave rise to a high water absorbency. Swelling of the hydrogel samples in saline solution (0.15 mol/L NaCl, CaCl₂ and AlCl₃) was examined. Swelling capacity of the chitosan-g-PAAm hydrogels in CaCl₂ and AlCl₃ solutions was higher than that of its hydrolyzed chitosan-g-PAAm (H-chitosan-g-PAAm) hydrogels. It was also indicated that the chitosan-g-PAAm and H-chitosan-g-PAAm hydrogels had different swelling capacities in various pHs. The latter hydrogel showed a pH-reversible property between 3 and 10. The swelling kinetics of both hydrogels were found to obey second-order kinetics.

Key Words: Chitosan, polyacrylamide, hydrogel, superabsorbent, pH-reversibility, swelling behavior

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