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Abstract
In this study, Chitosan-Poly (acrylic acid) (CS-PAA) complex nanoparticles were prepared by template polymerization of acrylic acid (PAA) in the chitosan solution. The preparation and characterization of CS-PAA nanoparticles including the yields of the nanoparticles, FT-IR spectrum analysis, dynamic light scattering, zeta potential, and morphology of nanoparticles were concentrated in this study. The effects of temperature, weight ratio of CS and PAA, and pH value on the physicochemical properties of nanoparticles were studied. It was found that the surface structure and zeta potential of nanoparticles can be controlled by different preparation processes, and the morphology was influenced by the pH value of the medium.
Results of our experiments showed that the diameter distribution of the CS-PAA nanoparticles was smallest when the polymerization was carried out at 70℃ for 45 minutes with a CS:AA ratio of 1:1. It was also found that the surface structure of the nanoparticles was most stable in a buffer solution at a pH value of 4.5 because of their smallest mean diameter (92.0±5.5 nm) and stable zeta potential (25.5±2.6 mV). The experiment of in vitro and in vivo drug release showed that these nanoparticles provided a sustained release of the entrapped drugs, which was better than that of commercial eye drops, and the release behavior was influenced by the pH value of the medium.
Chitosan precipitates at high pH environment due to its own characteristics. Nanoparticles prepared in this study was found to precipitate when pH value was greater than 6. To conquer this problem, chitosan was modified in the second part of this thesis.
The solubility of chitosan was affected by its degree of deacetylation (DD), viscosity, and molecular weight. The most important factor was the molecular weight. In this experiment, the depolymerization of chitosan by hydrogen peroxide was studied. Results of our experiments showed that the depolymerization rate of chitosan depended on the reaction temperature, the reaction time and the concentration of hydrogen peroxide. The 40k Dalton molecular weight of chitosan was obtained when the depolymerization was carried out at 60℃ for 2 hours using 2M H2O2.
The product maintained its good solubility and dispersion in high pH value and is suitable to be used

as carrier for ophthalmic drug delivery.
Advisory Committee Hong Ru Lin - advisor

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