

Sintesis dan karakterisasi hidrogel superabsorben kitosan poli (N-vinilkaprolaktam) (PNVCL) dengan metode full IPN (interpenetrating polymer network) = Synthesis and characterization of superabsorben hydrogel chitosan poly (N-vinylcaprolactam) (PNVCL) by full IPN (interpenetrating polymer network method)

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Abstrak

Material polimer untuk menyusun hidrogel harus dapat mengembang (swell) dan mempertahankan fraksi air pada strukturnya, namun tidak larut dalam air. Polimer alami memiliki gugus fungsi yang dapat menjadi pusat aktif reaksi dimana dapat dilakukan modifikasi untuk menghasilkan suatu polimer dengan karakteristik yang lebih baik. Kitosan merupakan polimer alami yang memiliki kekuatan struktur yang kurang dibandingkan kemampuan swelling. Sintesis hidrogel kitosan dengan metode full interpenetrating polymer network (IPN) dapat meningkatkan kekuatan struktur melalui ikat silang. Tahap pertama adalah sintesis jaringan polimer kitosan terikat silang asetaldehida. Tahap kedua adalah sintesis jaringan polimer PNVCL terikat silang N, N'-metilenbisakrilamida (MBA) melalui polimerisasi radikal bebas monomer NVCL dengan inisiator amonium persulfat (APS). Variasi waktu, rasio kitosan-PNVCL, konsentrasi agen pengikat silang, dan konsentrasi inisiator dipelajari untuk mengetahui kondisi optimum. Kondisi optimum diperoleh pada reaksi 2 jam dengan rasio kitosan/NVCL 90:10 (b/b %), konsentrasi MBA 0,5%, dan konsentrasi APS 3%. HSA kitosan-PNVCL memberikan rasio swelling 380,66% dan derajat ikat silang 60,85%. Karakterisasi HSA dilakukan dengan spektrofotometer Fourier Transform Infrared Spectroscopy (FTIR), Differential Scanning Calorimetry (DSC), Thermogravimetric analysis (TGA), Scanning Electron Microscope (SEM), dan X-Ray Diffraction (XRD).

*Polymer material used for hydrogel should have the ability to swell and to keep water molecules in its structure without dissolving in water. Natural polymers has functional groups which can perform as active sites in modification to produce polymer with better characteristic. Chitosan is a natural polymer which has good swelling ability but lack of structural strength. Synthesis of chitosan hydrogel by interpenetrating polymer network (IPN) will increase its strength through crosslinking. In this research, the first step of modification was the synthesis of chitosan polymer network crosslinked by acetaldehyde. The next step was the synthesis of PNVCL polymer network crosslinked by N,N-methylbisacrylamide (MBA) through free radical polymerization of NVCL monomer with ammonium persulfat (APS) as the initiator. Optimum reaction time, chitosan/PNVCL ratio (w/w %), concentration of crosslinker agent, and concentration of initiator had been observed. The optimum conditions were obtained as followed: 2 hours reaction, the ratio chitosan/PNVCL of 90:10 (w/w %), %-w MBA concentration of 0,5%, and APS concentration of 3%. The swelling ratio of the hydrogel was 380,66% while the crosslinking degree was 60,85%. Fourier transfor infrared spectroscopy (FTIR), Differential Scanning Calorimetry (DSC), Thermogravimetric analysis (TGA), Scanning Electron Microscope (SEM), and X-Ray diffraction (XRD) were used for the characterization of the hydrogel.*