

INTISARI

PEMBUATAN MANIK KOMPLEKS POLIELEKTROLIT KITOSAN-PEKTIN SEBAGAI ADSORBEN ZAT WARNA TEKSTIL MALACHITE GREEN DAN METIL VIOLET 2B

Telah dilakukan pembuatan manik kompleks polielektrolit (KPE) kitosan-pektin sebagai adsorben zat warna tekstil *malachite green* (MG) dan metil violet 2B (MV 2B). Penelitian bertujuan untuk pengujian pengaruh peningkatan komposisi pektin terhadap proses adsorpsi-desorpsi zat warna kationik MG dan MV 2B, serta mempelajari ketahanan manik KPE dalam medium asam dan basa.

Pembuatan KPE kitosan-pektin dilakukan dengan memvariasikan komposisi kitosan dan pektin (90%:10%-60%:40%) dilarutkan kedalam asam asetat 5% dengan konsentrasi campuran 4% (w/v), selanjutnya di koagulasikan dengan larutan NaOH 1 M. Manik yang terbentuk dikeringkan dan dikarakterisasi menggunakan FTIR, SEM, uji penyerapan air (*swelling*) dan uji ketahanan manik KPE dalam medium asam dan basa. Karakterisasi SEM dan FTIR untuk mengetahui morfologi permukaan dan penampang lintang serta kandungan gugus fungsional manik KPE. Uji kemampuan adsorpsi manik KPE terhadap zat warna MG dan MV 2B meliputi pengaruh komposisi kitosan:pektin, massa awal adsorben, waktu, pH, konsentrasi awal MG dan MV 2B, kinetika adsorpsi, isoterm adsorpsi serta dilakukan uji desorpsi zat warna MG dan MV 2B dari manik KPE menggunakan larutan NaCl 1 M dan pH 4.

Hasil penelitian menunjukkan manik KPE telah berhasil dibentuk dengan munculnya puncak karakteristik KPE pada panjang gelombang 1635 cm^{-1} berdasarkan data spektra FTIR. Data SEM menunjukkan bahwa morfologi permukaan manik yang berpori-pori kasar dan tidak teratur dengan ukuran rongga berkisar $2,5\text{--}15\text{ }\mu\text{m}$. Manik KPE kitosan-pektin tahan pada medium asam pH 4 dan basa pH 12. Kondisi optimum adsorpsi untuk MG pada pH 8, waktu kontak 120 menit dan konsentrasi 500 mg L^{-1} . Adsorpsi MV 2B pada pH 7, waktu kontak 360 menit dan konsentrasi 700 mg L^{-1} . Kapasitas adsorpsi maksimum komposisi manik KPE 60%:40% (kitosan:pektin) terhadap MG diperoleh $277,8\text{ mg g}^{-1}$, sedangkan terhadap MV 2B $322,6\text{ mg g}^{-1}$. Persentase desorpsi tertinggi manik KPE terhadap zat warna MG dan MV 2B diperoleh menggunakan larutan pH 4, dengan persentase desorpsi sebesar 9,8% untuk MG dan 9,3% untuk MV 2B. Kinetika dan isoterm adsorpsi MG dan MV 2B mengikuti kinetika orde dua semu dan model isoterm Langmuir.

Kata kunci: manik, kitosan, pektin, *malachite green*, metil violet 2B

ABSTRACT

PREPARATION OF CHITOSAN-PECTIN POLYELECTROLYTE COMPLEX BEADS FOR THE ADSORBENT OF TEXTILE DYE MALACHITE GREEN AND METHYL VIOLET 2B

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The chitosan-pectin polyelectrolyte complex (PEC) beads have been created for the adsorbent of textile dye malachite green (MG) and methyl violet 2B (MV 2B). The research aims to study the effect of increase pectin to adsorption-desorption process of cationic dye MG and MV 2B, and study the stability of beads in the acid medium and base medium.

Chitosan-pectin PEC was carried out by varying composition of chitosan and pectin (90%:10%-60%:40%) dissolve into 5% acetic acid solution with mixture concentration 4%, and coagulation process used NaOH solution 1 M. The beads were characterized by FTIR, SEM, ability to adsorb water (swelling) and the stability of beads in acid medium and base medium was tested. The SEM and FTIR characterization for showed the surface morphology and longitudinal section, and the contents of functional groups. The adsorption capacity of beads PEC toward dyes MG and MV 2B also was studied including the effect of beads composition, the mass of adsorbent, time, pH, the initial concentration of malachite green and methyl violet 2B. Adsorption kinetics, adsorption isotherm, and the desorption studies had been conducted in 1 M NaCl solution and pH 4 solution.

The results show, the beads have been successfully created with the appear peak characteristic PEC at a wavelength of 1635 cm^{-1} based FTIR spectra. The SEM results showed that surface morphology of PEC beads obtained porous rough and irregular with the size of hollow space between $2.5\text{--}15\text{ }\mu\text{m}$. Chitosan-pectin PEC beads has stability in an acidic solution of pH 4 and basic of pH 12. The optimum condition of MG adsorption occurs at pH 8, contact time 120 minutes and concentration of 500 mg L^{-1} . Adsorption for MV 2B occurs at pH 7, contact time 360 minutes with a concentration of 700 mg L^{-1} . Optimum adsorption capacity of PEC beads 60%: 40% (ratios chitosan: pectin) towards MG was 277.8 mg g^{-1} , whereas for MV 2B was 322.6 mg g^{-1} . The highest percentage of desorption of PEC beads toward MG and MV 2B was obtained when pH 4 solution was used, and the desorption was 9.8% for MG and 9.3% for MV 2B. Adsorption kinetics and isotherm of MG and MV 2B followed the pseudo second order with Langmuir isotherm.

Keywords: beads, chitosan, pectin, malachite green, methyl violet 2B.



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Pembuatan Manik Kompleks Polielektrolit Kitosan-Pektin Sebagai Adsorben Zat Warna Tekstil Malachite

Green dan Metil Violet 2B

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