

PEMBUATAN FILM KITOSAN KARBOKSIMETIL SELULOSA TERTAUT SILANG EDTA SEBAGAI ADSORBEN BIRU METILEN

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INTISARI

Telah dilakukan pembuatan film kitosan karboksimetil selulosa (CMC) tertaut silang EDTA sebagai adsorben biru metilen. Film dibuat dengan cara mencampurkan larutan kitosan 1%, CMC 0,1%, dan EDTA dengan berbagai perbandingan mol kitosan:EDTA. Larutan dituang ke dalam cawan petri kemudian dioven. Film yang sudah kering dilepaskan dari cawan dengan direndam pada larutan NaOH 0,2 M, kemudian dikeringkan pada suhu ruang. Film dikarakterisasi dengan FTIR dan SEM, serta diuji dalam medium asam dan basa. Film kitosan-CMC tertaut silang EDTA digunakan untuk adsorpsi biru metilen dengan pengkajian komposisi optimum film, waktu kontak optimum, pH medium optimum, variasi konsentrasi awal biru metilen, pengkajian kinetika adsorpsi, model isoterm adsorpsi dan kemampuan desorpsi.

Hasil analisis FTIR menunjukkan bahwa tidak begitu teramati puncak serapan khas interaksi kitosan-CMC terhadap EDTA. Sementara hasil SEM menunjukkan morfologi yang berbeda antara film tanpa taut silang dengan film tertaut silang EDTA. Film kitosan-CMC tertaut silang EDTA lebih stabil dalam medium asam dibandingkan dengan film tanpa taut silang. Kondisi optimum adsorpsi film kitosan-CMC tertaut silang EDTA terhadap biru metilen terjadi pada waktu kontak 100 menit, pH 9, dan konsentrasi awal biru metilen 200 mg L⁻¹ dengan kapasitas adsorpsi sebesar 149,7 mg g⁻¹. Adsorpsi mengikuti model kinetika pseudo orde kedua dan model isoterm Langmuir dengan energi 14,3 kJ mol⁻¹, sedangkan kemampuan desorpsi tertinggi sebesar 84,8% dalam larutan HCl 5% etanol dengan waktu 90 menit.

Kata kunci: film kitosan-CMC, EDTA, taut silang, adsorpsi, biru metilen

SYNTHESIS OF EDTA-CROSSLINKED CHITOSAN-CARBOXYMETHYL CELLULOSE FILM AS ADSORBENT FOR METHYLENE BLUE

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ABSTRACT

Synthesis of EDTA-crosslinked chitosan-carboxymethyl cellulose film as adsorbent for methylene blue has been done. The film was made by mixing chitosan 1%, CMC 0.1%, and EDTA in various mol ratio. The solution was then placed into a petri dish and evaporated. The dried film was released from the petri dish by using NaOH 0.2 M solution and dried at room temperature. The films was characterized by FTIR, SEM, and its stability in acid-base medium. The chitosan-CMC crosslinked by EDTA films were used for methylene blue adsorption. The parameters studied include contact time, pH of the medium, variation of methylene blue concentration, adsorption kinetics, adsorption isotherm model, and desorption ability.

The result of FTIR characterization showed no typical peak of chitosan-CMC-EDTA due to electrostatic interaction between them. Meanwhile the result of SEM showed the difference morphology between chitosan-CMC film and crosslinked film. EDTA-crosslinked chitosan-CMC film was more stable than non-crosslinked film in acid medium. Adsorption study showed that the optimum condition of methylene blue adsorption occurred at the contact time of 100 min., pH 9, and initial methylene blue concentration 200 mg L⁻¹ with adsorption capacity 149.7 mg g⁻¹. Adsorption followed pseudo second order and Langmuir isotherm model, giving adsorption energy of 14.3 kJ mol⁻¹. Desorption study suggested that the highest desorption 84.8% was achieved by using HCl 5% ethanol solution with contact time 90 min.

Keywords: chitosan-CMC film, EDTA, crosslink, adsorption, methylene blue