

SINTESIS FILM KOMPLEKS POLIELEKTROLIT KITOSAN/PEKTIN TERTAUT SILANG ASAM SULFAT DAN STUDI ADSORPSI-DESORPSINYA TERHADAP ASAM HUMAT

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INTISARI

Telah dilakukan penelitian tentang sintesis film kompleks polielektrolit (KPE) kitosan/pektin tertaut silang asam sulfat dan studi adsorpsi-desorpsinya terhadap asam humat. Sintesis film KPE dilakukan dengan cara melarutkan pektin dalam air dan kitosan dalam asam asetat, larutan film yang homogen dikeringkan pada suhu 70 °C, dinetralkan oleh akuades dan bufer fosfat dan direndam dalam larutan H₂SO₄. Film (0,5% b/v) dibuat dalam tiga variasi perbandingan massa kitosan dan pektin sebesar 70:30, 80:20 dan 90:10. Film dikarakterisasi menggunakan FTIR, uji penyerapan air, uji ketahanan dalam medium asam basa dan analisis morfologi dengan SEM. Studi adsorpsi film terhadap asam humat dilakukan dengan parameter pengkajian rasio komposisi optimum kitosan/pektin, waktu kontak optimum, pH larutan asam humat optimum, konsentrasi optimum asam humat serta pola kinetika adsorpsi, model isoterm dan kemampuan desorpsi.

Hasil karakterisasi film menunjukkan bahwa film tidak larut dalam air dan stabil pada pH 2–12. Analisis menggunakan FTIR menunjukkan terjadi pergeseran puncak serapan pada bilangan gelombang 1527 cm⁻¹ (vibrasi tekuk N–H pada –NH₃⁺). Hasil analisis dengan SEM menunjukkan perbedaan morfologi film sebelum dan sesudah adsorpsi serta setelah desorpsi. Adsorpsi mencapai titik optimumnya pada film dengan rasio komposisi kitosan:pektin 70:30, pada pH 6, waktu kontak 480 menit dan konsentrasi 450 mg L⁻¹. Model kinetika adsorpsi asam humat dapat dijelaskan melalui model kinetika orde kedua semu Ho dan McKay. Pola isoterm adsorpsinya mengikuti model isoterm Langmuir dengan kapasitas maksimum adsorpsi 50,0 mg g⁻¹, konstanta Langmuir (K_L) 1,49×10⁵ L mol⁻¹ dan energi adsorpsinya 29,7 kJ mol⁻¹. Desorpsi tertinggi sebesar 82,5% menggunakan larutan NaOH 1 M.

Kata kunci: asam humat, desorpsi, film KPE, kinetika adsorpsi

SYNTHESIS OF SULFURIC ACID-CROSSLINKED CHITOSAN/PECTIN POLYELECTROLYTE COMPLEX (PEC) FILM AND ITS ADSORPTION-DESORPTION STUDY FOR HUMIC ACID

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ABSTRACT

A research on the synthesis of sulfuric acid-crosslinked chitosan/pectin PEC film and its adsorption-desorption study for humic acid has been done. PEC film synthesized by dissolving pectin in aquadest and chitosan in acetic acid, then homogeneous film solution dried at 70 °C, neutralized by aquadest and phosphate buffer and immersed in H₂SO₄ solution. The film (0.5% w/v) was made in three variations in chitosan and pectin mass ratio of 70:30, 80:20 and 90:10. The film was characterized using FTIR, water absorption and pH test and morphological analysis with SEM. The parameters adsorption studied are optimum ratio of chitosan/pectin composition, contact time, effect of pH solution, humic acid concentration and also model of kinetics adsorption, isotherm adsorption and desorption ability.

The result showed that film is not soluble in water and stable at pH 2 to 12. The analysis using FTIR indicated a shift of absorption peak at wave number 1527 cm⁻¹ (bending vibration N-H in -NH₃⁺). Analysis with SEM showed the morphological differences of the film before and after adsorption and after desorption. Adsorption reached its optimum capacity in the film with ratio of chitosan and pectin composition 70:30, at pH 6, contact time 480 min and concentration 450 mg L⁻¹. The humic acid adsorption kinetics model should be explained by the second-order kinetic model of Ho & McKay. The adsorption isotherm follows the Langmuir isotherm model with a maximum adsorption capacity of 50.0 mg g⁻¹, the Langmuir constant (K_L) of 1.49×10⁵ L mol⁻¹ and the adsorption energy is 29.7 kJ mol⁻¹. The highest desorption is 82.5% using basic solution 1 M NaOH.

Keywords: adsorption kinetics, desorption, film PEC, humic acid