

PEMANFAATAN SELULOSA AKASIA MANGIUM (*Acacia mangium*) UNTUK SINTESIS KOMPOSIT MAGNETIT-SELULOSA-KITOSAN SEBAGAI ADSORBEN Cd(II)

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INTISARI

Komposit magnetit-selulosa-kitosan sebagai adsorben Cd(II) telah disintesis dengan memanfaatkan kayu akasia (*Acacia mangium*) sebagai bahan baku selulosa. Selulosa dari kayu akasia diisolasi melalui proses alkalisasi dengan NaOH 15%, *bleaching* dengan NaOCl 3% yang diasamkan dengan CH₃COOH glasial, dan hidrolisis asam dengan HCl 2,5 M menghasilkan nilai rendemen 57,1%. Selulosa yang diperoleh digunakan untuk sintesis komposit magnetit-selulosa-kitosan dan diaplikasikan sebagai adsorben Cd(II). Kinetika dan isoterm adsorpsi komposit magnetit-selulosa-kitosan terhadap logam Cd(II) dikaji melalui penentuan kondisi optimum dengan memvariasikan pH larutan, waktu kontak adsorpsi, konsentrasi awal adsorbat, dan suhu larutan. Karakteristik material komposit dipelajari melalui karakterisasi FTIR, XRD, SEM-EDX, dan VSM.

Hasil karakterisasi FTIR menunjukkan isolasi selulosa dari kayu akasia berhasil dilakukan dengan hilangnya gugus fungsi khas hemiselulosa dan lignin. Komposit yang dihasilkan memiliki sifat kemagnetan dibuktikan dengan kemampuannya dalam merespon medan magnet eksternal. Sifat magnetik komposit mempermudah proses pemisahan dari larutan adsorbat. Kajian adsorpsi menunjukkan proses adsorpsi Cd(II) oleh magnetit-selulosa-kitosan mengikuti model kinetika orde kedua semu Ho-McKay dengan nilai konstanta laju adsorpsi 0,0091 g mg⁻¹ menit⁻¹. Isoterm adsorpsi mengikuti model isoterm Langmuir dengan nilai K_L sebesar 0,0973 L mol⁻¹ dan kapasitas maksimum adsorpsi sebesar 11,9% mg g⁻¹. Proses adsorpsi terjadi secara spontan dan bersifat endotermis ditinjau dari kajian parameter termodinamika.

Kata kunci: adsorpsi, isoterm, kinetika, komposit magnetit-selulosa-kitosan, logam Cd(II)

**UTILIZATION OF ACACIA MANGIUM (*Acacia mangium*) FOR
SYNTHESIS OF MAGNETITE-CELLULOSE-CHITOSAN
COMPOSITE AS Cd(II) ADSORBENT**

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ABSTRACT

Magnetite-celullose-chitosan composite as a Cd(II) adsorbent has been synthesized by utilizing acacia wood (*Acacia mangium*) as cellulose raw material. Cellulose from acacia wood was isolated through alkalization process with 15% NaOH, bleaching with 3% NaOCl acidified with CH₃COOH glacial, and acid hydrolysis with HCl 2.5 M resulting in a yield value of 57.1%. The cellulose obtained was used for the synthesis of magnetite-cellulose-chitosan composites and applied as a Cd(II) adsorbent. The adsorption kinetics and isotherm of the magnetite-cellulose-chitosan composites for Cd(II) metal were studied by determining the optimum conditions for solution pH, adsorption contact time, initial adsorbate concentration, and temperature. Composite material characteristics were studied through FTIR, XRD, SEM-EDX, and VSM characterization.

Efficacy of the cellulose isolation process from acacia wood was demonstrated in the results of FTIR characterization with the removal functional groups of hemicellulose and lignin. The composites has magnetic properties proven by its ability to respond external magnetic fields. The magnetic properties facilitate the separation process from the adsorbate solution. Adsorption studies reveal that the Cd(II) adsorption process by magnetite-cellulose-chitosan follows Ho-McKay pseudo second order kinetic model with an adsorption rate constant of 0.0091 g mg⁻¹ min⁻¹. The adsorption isotherm follows the Langmuir isotherm model with K_L value of 0.0973 L mol⁻¹ and a maximum adsorption capacity of 11.9 mg g⁻¹. The adsorption process occurs spontaneously and endothermic in terms of the study of thermodynamic parameters.

Keywords: adsorption, Cd(II) metal, isotherm, kinetic, magnetit-cellulose-chitosan composite