



SINTESIS MANIK KOMPOSIT ASAM HUMAT-ALGINAT TERLAPISI KARBON AKTIF SEBAGAI ADSORBEN Cd(II)

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ABSTRAK

Penelitian mengenai pembuatan manik asam humat-alginat-karbon aktif sebagai adsorben Cd(II) telah dilakukan. Manik yang sudah terbentuk dalam larutan CaCl_2 kemudian dikeringkan. Karakterisasi manik asam humat-alginat terlapisi karbon aktif dilakukan menggunakan Spektrometer FTIR, AAS, SAA, SEM-EDX, uji pengembangan dan uji stabilisasi pada larutan pH 2-12. Pengujian adsorpsi manik pada Cd(II) dilakukan dengan pengkajian komposisi optimum manik, pH optimum, waktu kontak optimum, konsentrasi optimum larutan logam Cd(II), dan pengkajian kinetika adsorpsi, serta model isoterm. Analisis pada pengujian adsorpsi menggunakan spektrofotometer AAS.

Manik berhasil disintesis melalui teknik ekstruksi. Hasil karakterisasi FTIR, SEM dan SAA menunjukkan interaksi antara alginat, karbon aktif dan asam humat melalui gugus $-\text{COOH}$ dan $-\text{OH}$ dengan struktur mesopori dan manik stabil pada pH 2-6. Pada kajian adsorpsi, manik dengan komposisi 1:1:1 untuk alginat:asam humat:karbon aktif menunjukkan kemampuan adsorpsi tertinggi. Kondisi optimum adsorpsi diperoleh pada pH 6 dan menit ke-150 dengan kinetika adsorpsi mengikuti orde dua semu dengan nilai $k = 1.23 \times 10^{-3} \text{ g mg}^{-1} \text{ menit}^{-1}$. Proses adsorpsi mengikuti isoterm Freundlich dengan konstanta Freundlich mencapai 4.4987 L g^{-1} . Kajian desorpsi menunjukkan bahwa larutan Na_2EDTA mendesorpsi dengan persentase tertinggi mencapai 84 %.

Kata kunci: manik, Ca-alginat, asam humat, karbon aktif, adsorpsi, logam Cd(II)



SYNTHESIS OF HUMIC ACID-ALGINATE- ACTIVATED CARBON COMPOSITE BEADS AS ADSORBENT FOR Cd(II)

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ABSTRACT

Humic acid-alginate-activated carbon composite beads had been synthesized and applied as an adsorbent for Cd(II). CaCl₂ had been used as crosslinker agent for stabilizing the beads. Characterization of the beads was carried out using FTIR, Surface Area Analyzer, SEM-EDX, swelling tests and stabilization tests in a solution of pH 2-12. The adsorption study of Cd(II) included the optimum composition of the beads, optimum adsorption pH, optimum contact time, the optimum concentration of Cd(II) solution, and assessment of adsorption kinetics, as well as isotherm models. Cd(II) concentration was measured using Atomic Absorption Spectrometer.

Beads was successfully synthesized through extrusion technique. The results of FTIR, SEM and SAA characterization showed the interaction between alginate, activated carbon and humic acid through the -COOH and -OH functional groups with mesoporous character and beads stable at pH 2-6. In the adsorption study, beads with a composition of 1: 1: 1 for alginate: humic acid: activated carbon shows the highest adsorption ability. The optimum conditions for adsorption were obtained at pH 6 and 150 minutes with adsorption kinetics followed the pseudo-second order with $k = 1.23 \times 10^{-3} \text{ g mg}^{-1} \text{ minute}^{-1}$. The adsorption process followed the Freundlich isotherm with the value of Freundlich constant reach 4,4987 L g⁻¹. The desorption study showed that Na₂EDTA solution has the highest percentage attained 84%.

Keywords: activated carbon, adsorption, Ca-alginate, beads, humic acid, Cd(II)