



SINTESIS *BEADS* KITOSAN-ASAM HUMAT SEBAGAI ADSORBEN Cd(II)

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INTISARI

Penelitian tentang sintesis *beads* kitosan-asam humat (KAH) sebagai adsorben Cd(II) telah dilakukan. *Beads* disintesis menggunakan metode koaservasi kompleks menggunakan komposisi kitosan:asam humat 50:50. *Beads* yang dihasilkan kemudian dianalisis menggunakan FTIR untuk identifikasi gugus fungsi dan SEM untuk menganalisis permukaan *beads* sebelum adsorpsi, sesudah adsorpsi serta sesudah desorpsi Cd(II). Parameter pengujian kualitas *beads* sebagai adsorben Cd(II) diantaranya kemampuan penyerapan air, ketahanan dalam medium asam dan basa, pengaruh waktu kontak, pH larutan, konsentrasi awal, kinetika adsorpsi, isoterm adsorpsi serta kajian desorpsinya.

Puncak serapan FTIR dari *beads* KAH menunjukkan kemiripan dengan berbagai puncak material penyusunnya, diantaranya keberadaan gugus -OH pada daerah 3448 cm^{-1} , gugus -NH₂ pada daerah 1635 cm^{-1} , gugus O-C-O pada daerah 1087 cm^{-1} dan gugus C=C aromatis yang terdeteksi pada daerah 1381 cm^{-1} . Data SEM setelah adsorpsi ion Cd(II) menunjukkan perubahan yang signifikan terhadap permukaan *beads*. Adsorpsi ion Cd(II) pada *beads* KAH optimum pada pH 6, waktu kontak 90 menit dan konsentrasi 80 mg L^{-1} . Pola isoterm adsorpsinya mengikuti model Langmuir dengan kapasitas maksimum adsorpsi (q_m) $41,67\text{ mg g}^{-1}$, Konstanta Langmuir (K_L) $1.610,7\text{ L mol}^{-1}$ dan energi adsorpsi $18,29\text{ kJ mol}^{-1}$. Model kinetika adsorpsi Cd(II) pada *beads* KAH dapat dijelaskan melalui Model pseudo orde dua McKay & Ho dengan harga konstanta laju adsorpsi (k) mencapai $3,46 \times 10^{-3}\text{ mg g}^{-1}\text{ menit}^{-1}$. Model difusi intrapartikel dan difusi Bangham menunjukkan bahwa difusi pori bukan tahapan penentu laju. Model difusi Boyd, model isoterm Dubinin-Radushkevich (D-R) dan kajian desorpsi menunjukkan adsorpsi berlangsung melalui interaksi kimia.

Kata kunci: *beads*, kitosan, asam humat, adsorpsi, Cd(II).



SYNTHESIS OF CHITOSAN-HUMIC ACID BEADS FOR THE ADSORBENT OF Cd(II)

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ABSTRACT

A research about synthesis of chitosan-humic acid beads for the adsorbent of Cd(II) has been done. The beads has been obtained by coaservation method using mass ratio of chitosan:humic acid of 50:50. Functional groups of the beads was then identified using FTIR. SEM was used to analyze the surface of beads before adsorption, after adsorption and after desorption. Some parameters that represent the quality of beads have been examined such as water absorption capacity, medium acidity, influences of contact time, pH, initial metal ion concentration, adsorption kinetics, adsorption isotherms and desorption study.

The FTIR results showed peak similiarities with starting materials. Peaks of vibration that showed at 3448 cm^{-1} , 1635 cm^{-1} , 1087 cm^{-1} and 1381 cm^{-1} indicate the existence of $-\text{OH}$, $-\text{NH}_2$, $\text{O}-\text{C}-\text{O}$, and $\text{C}=\text{C}$ aromatics, respectively. The SEM images after adsorption of Cd(II) showed that the surface of beads was significantly changed. Adsorption of Cd(II) onto KAH beads was optimum at pH 6, contact time of 90 minutes and the optimum initial concentration of 80 mg L^{-1} . Isotherm model of Cd(II) adsorption followed Langmuir's model with maximum adsorption capacity (q_m) of 41.67 mg g^{-1} , adsorption constant (K_L) of $1,610.67\text{ L mol}^{-1}$ and adsorption energy of 18.29 kJ mol^{-1} . Adsorption kinetics of Cd(II) onto KAH beads was succesfully explained with pseudo-two model by McKay & Ho with rate adsorption constant (k) of $3.462 \times 10^{-3}\text{ mg g}^{-1}\text{ minutes}^{-1}$. Intraparticle and Bangham's diffusion models showed that pore diffusion was not the rate determining step. Boyd diffusion, Dubinin-Radushkevich (D-R) isotherm and desorption study showed that adsorption occur through chemical interaction.

Key words: beads, chitosan, humic acid, adsorption, Cd(II).