

SINTESIS KOMPOSIT MAGNETIT/KARBON AKTIF/KITOSAN UNTUK ADSORPSI Cr(III)

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INTISARI

Sintesis komposit magnetit/karbon aktif/kitosan untuk adsorpsi Cr(III) telah dilakukan. Penelitian diawali sintesis karbon aktif dari ampas tebu dan dilanjutkan sintesis komposit dengan metode kopresipitasi. Material dikarakterisasi dengan *Fourier Transform Infra-Red Spectroscopy* (FTIR) untuk identifikasi gugus fungsional, *X-Ray Diffraction* (XRD) untuk uji kristalinitas, dan *Scanning Electron Microscope Energy Dispersive X-Ray Spectrometer* (SEM-EDX) untuk analisis morfologi. Kajian adsorpsi logam Cr(III) adalah variasi pH, kinetika adsorpsi, isoterm adsorpsi dan energi adsorpsi. Kandungan logam Cr(III) pada larutan dianalisis dengan *Atomic Absorption Spectrophotometer* (AAS).

Hasil karakterisasi menunjukkan bahwa sintesis komposit magnetit/karbon aktif/kitosan berhasil disintesis dengan metode kopresipitasi. Kajian adsorpsi logam Cr(III) terhadap komposit terjadi secara optimum pada pH 7. Adsorpsi Cr(III) mengikuti model kinetika orde kedua semu dengan nilai k sebesar $1,23 \times 10^{-2} \text{ g mg}^{-1} \text{ menit}^{-1}$. Isoterm adsorpsi Cr(III) mengikuti isoterm Langmuir dengan nilai K_L $0,464 \text{ L mg}^{-1} \text{ menit}^{-1}$ dan q_{maks} sebesar $11,26 \text{ mg g}^{-1}$. Parameter termodinamika menunjukkan bahwa adsorpsi komposit magnetit/karbon aktif /kitosan sebagai adsorben Cr(III) terjadi secara spontan pada suhu 50 dan 60 °C dan terjadi secara tidak spontan pada suhu 25 dan 40 °C. Reaksi yang berlangsung bersifat endotermis.

Kata kunci: magnetit, karbon aktif, kitosan, adsorpsi, Cr(III)

SYNTHESIS OF MAGNETITE/ACTIVATED CARBON/CHITOSAN COMPOSITES FOR Cr(III) ADSORPTION

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ABSTRACT

Synthesis of magnetite/activated carbon/chitosan composites for Cr(III) adsorption has been conducted. Experiment was firstly initiated by synthesis of activated carbon from sugarcane bagasse. The composite was synthesized by coprecipitation method. Material characterized by *Fourier Transform Infra-Red Spectroscopy* to identify the functional groups, *X-Ray Diffraction* used to analyzed the crystallinity and *Scanning Electron Microscope-Energy Dispersive X-Ray Spectrometer* used to know the morphology of material. Adsorption study of Cr(III) consist of variations of pH, adsorption kinetic, adsorption isotherm and adsorption energy. Amount of Cr(III) in aqueous solution after adsorption was analyzed by *Atomic Absorption Spectrophotometer*.

The characterization of material showed that the synthesis of magnetite/activated carbon/chitosan composite as adsorbent of chromium(III) was succesfully carried out through the coprecipitation method. Adsorption of Cr(III) by magnetite/activated carbon/chitosan composite showed optimum condition at pH 7. Adsorption kinetic followed pseudo second order with the value of $k = 1.23 \times 10^{-2} \text{ g mg}^{-1} \text{ min}^{-1}$. Isotherm adsorption followed Langmuir isotherm with K_L $0.464 \text{ L mg}^{-1} \text{ min}^{-1}$ and q_{\max} 11.26 mg g^{-1} . The thermodynamic parameters showed that the adsorption of the magnetite/activated carbon/chitosan composite as Cr(III) adsorbent occurred spontaneously at 50 and 60 °C and non-spontaneously at 25 and 40 °C. The reaction that takes place is endothermic.

Keywords: magnetite, activated carbon, chitosan, adsorption, Cr(III)