

## **SINTESIS ADSORBEN HIDROKSIAPATIT TERIMOBILISASI ASAM HUMAT DAN APLIKASINYA UNTUK ADSORPSI Cu(II)**

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### **INTISARI**

Telah dilakukan sintesis adsorben hidroksiapatit terimobilisasi asam humat dan aplikasinya untuk adsorpsi Cu(II). Penelitian ini bertujuan untuk mempelajari sintesis adsorben hidroksiapatit terimobilisasi asam humat, menentukan pH optimum, isoterm dan kinetika adsorpsi Cu(II) pada adsorben hidroksiapatit terimobilisasi asam humat.

Asam humat diisolasi dari tanah gambut Rawa Pening, sedangkan hidroksiapatit disintesis dari cangkang telur bebek. Adsorben dihasilkan dari proses imobilisasi asam humat pada hidroksiapatit. Produk adsorben dikarakterisasi menggunakan spektrofotometer FTIR, XRD dan SEM-EDX. Kinerja adsorben dalam melakukan adsorpsi ion Cu(II) ditentukan oleh stabilitas adsorben, pengaruh keasaman pada adsorpsi, pola isoterm, kinetika adsorpsi, dan pelepasan ion Cu(II).

Hasil penelitian didapatkan asam humat dengan kadar abu sebesar 10%, hidroksiapatit dengan kemurnian 76% dan HAp-AH dengan kemurnian 78% dari massa awal campuran asam humat hidroksiapatit. Puncak serapan FTIR HAp-AH menunjukkan adanya kemiripan dengan puncak material penyusunnya, diantaranya pada daerah  $3425\text{ cm}^{-1}$  dan  $1635\text{ cm}^{-1}$  menunjukkan gugus  $\text{-OH}$  dan  $\text{C=C}$  aromatis dan gugus  $\text{-P-O}$  yang terdeksi pada daerah  $1041$  dan  $570\text{ cm}^{-1}$ . Difraktogram XRD menunjukkan kemiripan kristalinitas HAp-AH dengan hidroksiapatit yang merupakan material penyusunnya, dan data SEM setelah adsorpsi menunjukkan perubahan yang signifikan terhadap permukaan HAp-AH. Adsorpsi ion Cu(II) pada HAp-AH optimum pada pH 5. Model isoterm adsorpsi mengikuti model Freundlich dengan kapasitas maksimum adsorpsi ( $q_m$ ) sebesar  $208\text{ mg g}^{-1}$  dan Konstanta Freundlich ( $K_F$ )  $0,215\text{ L mg}^{-1}$ . Model kinetika adsorpsi mengikuti model McKay & Ho dengan harga konstanta laju adsorpsi ( $k$ ) mencapai  $3,18 \times 10^{-4}\text{ g mol}^{-1}\text{ min}^{-1}$ .

Kata kunci: Adsorpsi, asam humat, hidroksiapatit.

***SYNTHESIS OF ADSORBENT HYDROXYAPATITE IMMOBILIZED HUMIC ACID AND ITS APPLICATION FOR ADSORPTION OF Cu(II)***

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**ABSTRACT**

Synthesis of adsorbent hydroxyapatite immobilized humic acid and its application of Cu(II) has been conducted. This research aims to do synthesis adsorbent hydroxyapatite immobilized and to determine the optimum pH, isotherm, and kinetics adsorption of Cu(II) by hydroxyapatite immobilized humic acid.

Humic acid was isolated from the peat soil of Rawa Pening, while hydroxyapatite was synthesized from duck eggshell. Adsorbents are produced from the humic acid immobilization process on hydroxyapatite. The adsorbent product was characterized using spectrophotometer FTIR, XRD, and SEM-EDX. The performance of adsorbents in the adsorption of Cu (II) ions are determined by the stability of adsorbents, the effect of acidity on adsorption, adsorption isotherm, adsorption kinetics, and release of Cu (II) ions.

The result obtained from the humic acid with a ash level of 10%, hydroxyapatite with a purity of 76% and HAp-AH with a purity of 78% from the initial mass of the hydroxyapatite and humic acid mixture. The results of characterization with FTIR results showed peak similarities with starting materials. Peaks of vibration that shows at  $3425\text{ cm}^{-1}$  and  $1635\text{ cm}^{-1}$  indicate the existence of  $-\text{OH}$  and  $\text{C}=\text{C}$  aromatics and peak of vibration  $-\text{P}-\text{O}$  that show at  $1041$  and  $570\text{ cm}^{-1}$ . XRD difratogram explain crystallinity similarity between HAp-AH and hydroxyapatite its constituent materials, and the SEM images after adsorption showed significant change to the surface of HAp-HA. Adsorption of Cu(II) by HAp-AH optimum at pH 5. Isotherm model of Cu(II) adsorption follows Freundlich's model with maximum adsorption capacity ( $q_m$ ) of  $208\text{ mg g}^{-1}$  and Freundlich constant ( $K_F$ ) of  $0,215\text{ L mg}^{-1}$ . Adsorption kinetics of Cu(II) HAp-AH was successfully explained with pseudo-two model by McKay & Ho with rate adsorption constant ( $k$ ) of  $3,18 \times 10^{-4}\text{ g mol}^{-1}\text{ min}^{-1}$ .

Keywords: Adsorption, hydroxyapatite, humic acid.