

## **STUDI ADSORPSI ION Cu(II) DENGAN ADSORBEN SELULOSA/ALGINAT TERTAUT SILANG-EPIKLOROHIDRIN**

M. Ichsan Apriyansyah  
16/398576/PA/17537

### **INTISARI**

Penelitian berjudul studi adsorpsi ion Cu(II) dengan adsorben selulosa/alginate tertaut silang-epiklorohidrin telah dilakukan. Penelitian ini bertujuan untuk melakukan sintesis adsorben selulosa/alginate tertaut silang-epiklorohidrin (S-EPI-A), menentukan pH optimum adsorpsi ion Cu(II) menggunakan adsorben S-EPI-A, mempelajari pengaruh waktu terhadap adsorpsi ion Cu(II) menggunakan adsorpsi S-EPI-A, dan menentukan isoterm adsorpsi ion Cu(II) menggunakan adsorben S-EPI-A. Selulosa diisolasi dari tanaman eceng gondok melalui proses hidrolisis, delignifikasi, dan *bleaching*. Adsorben disintesis dengan menaut silangkan selulosa hasil sintesis dengan natrium alginate menggunakan agen penaut silang epiklorohidrin, hasil sintesis dikarakterisasi dengan menguji kestabilannya dan dilakukan analisis struktur menggunakan FT-IR Shimadzu FT-IR 8201 PC, XRD Shimadzu XRD 6000, dan SEM-EDX Hitachi SU3500.

Hasil yang didapatkan bahwa struktur S-EPI-A stabil ketika dilarutkan pada pH 2-8, Spektra FTIR menunjukan puncak pada  $1050-1085\text{ cm}^{-1}$  dan  $850-900\text{ cm}^{-1}$  yang menandakan keberadaan vibrasi regang gugus C-O milik dan vibrasi gugus (1,4)  $\beta$  milik ikatan glikosidik dan manuronat milik S, Na-A, dan S-EPI-A. Hasil analisis XRD didapatkan pergeseran puncak pada  $13^\circ$ ,  $15^\circ$ ,  $19^\circ$  dan  $21^\circ$  menjadi  $14^\circ$ ,  $16^\circ$ ,  $20^\circ$ , dan  $22^\circ$  yang menandakan adanya perubahan kristalinitas dari S dan Na-A pada proses sintesis S-EPI-A. Hasil analisis SEM-EDX diamati morfologinya melalui citra SEM yang mana citra milik S-EPI-A memiliki karakteristik milik senyawa pembentuknya yaitu S dan Na-A, dari data SEM-EDX S-EPI-A-Cu diamati keberadaan Cu(II) pada citranya muncul bentuk yang memiliki karakteristik seperti Cu(II) dan muncul puncak milik Cu(II) pada puncak-puncak SEM-EDXnya. Pada aplikasi adsorpsi Cu(II) menggunakan S-EPI-A didapatkan pH optimum adsorpsi pada pH 6, model kinetika adsorpsi yang mengikuti orde dua semu, dengan konstanta laju sebesar  $2,79 \times 10^{-3}\text{ g mg}^{-1}\text{ min}^{-1}$ , model isoterm adsorpsi yang mengikuti isoterm Langmuir dengan  $q_{\text{maks}} 27,07\text{ mg g}^{-1}$  dan energi adsorpsi  $2,59\text{ kJ mol}^{-1}$  lalu terdesorpsi dengan baik menggunakan pelarut  $\text{Na}_2\text{EDTA}$ , HCl, dan  $\text{NH}_4\text{Cl}$ .

Kata kunci: adsorpsi, desorpsi, S-EPI-A

***STUDY ON THE ADSORPTION OF Cu(II) ION BY EPICHLOROHYDRIN-  
CROSSLINKED CELLULOSE/ALGINATE ADSORBENT***

M. Ichsan Apriyansyah

16/398576/PA/17537

**ABSTRACT**

Research entitled study on the adsorption of Cu(II) ion by epichlorohidrin-crosslinked cellulose/alginate has been carried out. The purpose of this research is to synthesize epichlorohidrin-crosslinked cellulose/alginate (S-EPI-A), determine the optimum pH of Cu(II) adsorption using S-EPI-A adsorbent, study the effect of time on adsorption of Cu(II) ion using S-EPI-A adsorbent, and determine Cu(II) ion adsorption isotherms using S-EPI-A adsorbent. Cellulose isolated from water hyacinth plants using hydrolysis, delignification and bleaching process. The adsorbent sythesize is start with crosslinking the cellulose isolated from water hyacinth with sodium alginate using epichlorohydrin as crosslinker agent. The result from the process will be characterized by stability test of (S-EPI-A), the result were also analyze using FTIR Shimadzu FTIR 8201 PC, XRD Shimadzu XRD 6000, dan SEM-EDX Hitachi SU3500.

The result stability test show that the structure of S-EPI-A is stable when dissolved at pH 2-8, FTIR spectra show the peaks at  $1050-1085\text{ cm}^{-1}$  and  $850-900\text{ cm}^{-1}$  which indicate the presence of stretching vibrations of the C-O group and (1,4)  $\beta$  group belonging to the glycosidic and manurorate bonds of S, Na-A, and S-EPI-A. The result of XRD analysis obtained a peak shift at  $13^\circ$ ,  $15^\circ$ ,  $19^\circ$  and  $21^\circ$  to  $14^\circ$ ,  $16^\circ$ ,  $20^\circ$ , and  $22^\circ$  which indicates a change in the cristalinity of S, and Na-A in the S-EPI-A synthesis process. The result of SEM-EDX analysis were observed for the morphology through SEM images, which S-EPI-A had the characeristics of the constituent compound S and Na-A, from the SEM-EDX S-EPI-A-Cu data, it was observed the presence of Cu(II) in the image appeared a shape that had characteristic like Cu(II) and a peak of Cu(II) appeared on the SEM-EDX peaks. In the adsorption application using S-EPI-A, the optimum pH of adsorption was obtained at pH 6, the adsorption kinetics model that follows the pseudo second order, with a rate constant  $2.79 \times 10^{-3}\text{ g mg}^{-1}\text{ min}^{-1}$ , the model adsorption isotherm that follows the langmuir isotherm with  $q_{\text{max}} 27.07\text{ mg g}^{-1}$  and adsorption energy of  $2.59\text{ kJ mol}^{-1}$  then properly desorbed using  $\text{Na}_2\text{EDTA}$ ,  $\text{HCl}$ , and  $\text{NH}_4\text{Cl}$  solvents.

Keywords: adsorption, desorption, S-EPI-A