

INTISARI

KAJIAN ADSORPSI ION FOSFAT DALAM AIR TAWAR MENGGUNAKAN *BEADS* Ca-ZEOLIT-ALGINAT DAN Ca-Fe-ZEOLIT-ALGINAT

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Telah dilakukan adsorpsi ion fosfat dalam air tawar menggunakan *beads* Ca-zeolit-alginat dan Ca-Fe-zeolit-alginat. Tujuan penelitian ini adalah membuat adsorben fosfat yang efektif. Penelitian ini dilaksanakan melalui tiga proses yaitu proses pembuatan adsorben Ca-zeolit-alginat dan Ca-Fe-zeolit-alginat, karakterisasi masing-masing adsorben dengan menggunakan *Fourier Transform Infrared* (FTIR) dan *Surface Area Analyzer* (SAA), serta pengkajian adsorpsi ion fosfat pada variasi massa adsorben, pH, waktu kontak dan konsentrasi adsorbat.

Karakterisasi adsorben menggunakan FTIR menunjukkan adanya panjang gelombang baru pada adsorben setelah adsorpsi di daerah panjang gelombang 2931 cm^{-1} yang mengindikasikan adanya vibrasi ulur P=O pada *beads* Ca-zeolit-alginat dan Fe-zeolit-alginat. Berdasarkan BET *multiple point* didapatkan luas permukaan 184,19 $\text{m}^2 \cdot \text{g}^{-1}$ untuk Ca-zeolit-alginat dan 198,85 $\text{m}^2 \cdot \text{g}^{-1}$ untuk Ca-Fe-zeolit-alginat. *Beads* Ca-zeolit-alginat dan Ca-Fe-zeolit-alginat memiliki massa optimal pada 2 g dan 3 g. Kinetika adsorpsi Ca-zeolit-alginat mengikuti model pseudo orde satu Lagergren dengan nilai k_1 sebesar $1,9 \times 10^{-3} \text{ menit}^{-1}$, sedangkan Fe-zeolit-alginat mengikuti model pseudo orde 2 Ho dengan nilai k_2 sebesar $2,5 \times 10^{-1} \text{ g} \cdot \text{mg}^{-1}$. Adsorben Ca-zeolit-alginat dan Ca-Fe-zeolit-alginat mengikuti model Isotermal Freundlich dengan nilai K_F $8,11 \times 10^{-3} \text{ L} \cdot \text{g}^{-1}$ dan $2,78 \text{ L} \cdot \text{g}^{-1}$. Adsorben Ca-zeolit-alginat dan Ca-Fe-zeolit-alginat memiliki energi rata-rata adsorpsi (E_D) sebesar 1,55 $\text{KJ} \cdot \text{mol}^{-1}$ dan 3,78 $\text{KJ} \cdot \text{mol}^{-1}$. Adsorpsi ion fosfat dalam air tawar menggunakan kedua adsorben mengikuti adsorpsi fisika.

Kata kunci : adsorpsi, alginat, zeolit, ion fosfat, dan isotermal adsorpsi

ABSTRACT

ADSORPTION STUDY OF PHOSPHATE ION IN FRESH WATER USING Ca-ZEOLITE-ALGINATE AND Ca-Fe-ZEOLITE-ALGINATE BEADS

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Adsorption study of phosphate ion in freshwater using Ca-zeolite-alginate and Fe-zeolite-alginate beads have been performed. The purpose of this study is to make an effective phosphate adsorbent. This research was carried out through three processes i.e.: synthesis beads of Ca-zeolite-alginate and Fe-zeolite-alginate, characterization of both adsorbents using Fourier Transform Infrared (FTIR), and Surface Area Analyzer (SAA), and studied the influence of adsorbent mass, pH, contact time and ion phosphate concentration variations.

Adsorbent characterization using FTIR showed that the adsorbents have new wavelength number after adsorption at 2931 cm^{-1} as P=O stretch vibration on Ca-zeolite-alginate and Ca-Fe-zeolite-alginate beads. Based on BET multiple point, the surface area of Ca-zeolite-alginate was $184,19\text{ m}^2.\text{g}^{-1}$, and Ca-Fe-zeolite-alginate was $198,85\text{ m}^2.\text{g}^{-1}$. Beads Ca-zeolite-alginate and Fe-zeolite-alginate have the optimum mass of 2 g and 3 g. Adsorption kinetics of Ca-zeolite-alginate followed Lagergren model by pseudo first order with $k_1\ 1,9 \times 10^{-3}\ \text{minute}^{-1}$ and Ca-Fe-zeolite-alginate followed Ho model by pseudo second order with $k_2\ 2,5 \times 10^{-1}\ \text{g.mg}^{-1}$. Both of beads Ca-zeolite-alginate and Fe-zeolite-alginate followed Freundlich isothermal model with $K_F\ 8,11 \times 10^{-3}\ \text{L.g}^{-1}$ and $2,78\ \text{L.g}^{-1}$. Beads of Ca-zeolite-alginate and Ca-Fe-zeolite-alginate has an energy of adsorption (E_D) of $1,55\ \text{KJ.mol}^{-1}$ and $3,78\ \text{KJ.mol}^{-1}$. Adsorption of phosphate ion in fresh water using both adsorbent followed physical adsorption.

Keyword: adsorption, alginate, zeolite, phosphate ion, and adsorption isothermal.