

ADSORPSI-DESORPSI Zn(II) DENGAN SILIKA TERMODIFIKASI KITOSAN TERLAPIS PADA BAHAN MAGNETIK PASIR BESI

An Nur Zajar
14/364427/PA/15997

INTISARI

Telah dilakukan penelitian untuk mengkaji adsorpsi-desorpsi ion Zn(II) dengan silika termodifikasi kitosan terlapis pada bahan magnetik pasir besi (BM@SiO₂/K). Adsorben BM@SiO₂/K disintesis melalui metode sol-gel dengan penghubung 3-glisidoksi propiltrimetoksisilan (GPTMS). Adsorben BM@SiO₂/K dikarakterisasi dengan spektrofotometer *Fourier Transform Infrared* (FTIR), *Scanning Electron Microscope-Energy Dispersive Spectrometer* (SEM-EDX) dan *X-Ray Diffraction* (XRD). Adsorpsi ion Zn(II) dilakukan dengan variasi pH, waktu kontak dan konsentrasi awal ion Zn(II) hingga diperoleh titik optimum dan kapasitas adsorpsi yang maksimum. Desorpsi Zn(II) dilakukan dengan variasi jenis larutan pendesorpsi HCl, HNO₃, KNO₃ dan NaOH. Konsentrasi ion Zn(II) dalam larutan sebelum dan setelah adsorpsi-desorpsi dianalisis dengan *Atomic Absorption Spectroscopy* (AAS).

Hasil karakterisasi menunjukkan bahwa bahan magnetik berhasil dilapisi oleh SiO₂ dan kitosan melalui penghubung GPTMS. BM@SiO₂/K memiliki tekstur kasar dan bentuk tidak teratur dengan ukuran kristalit 35,99 nm dan ukuran partikel BM@SiO₂/K 49,28 nm dengan persentase N sebesar 7,35%. Adsorpsi Zn(II) dengan BM@SiO₂/K optimum pada pH 6, waktu kontak 90 menit dan konsentrasi awal Zn(II) 50 ppm. Kinetika adsorpsi Zn(II) mengikuti model orde kedua semu dengan konstanta laju adsorpsi (k) sebesar $5,6 \times 10^{-2} \text{ mg g}^{-1} \text{ menit}^{-1}$. Adsorpsi ion Zn(II) mengikuti model isoterm Langmuir dengan konstanta Langmuir (K_L) $8,6 \times 10^{-2} \text{ L mg}^{-1}$ dan kapasitas adsorpsi maksimum (q_m) $12,76 \text{ mg g}^{-1}$. Uji desorpsi menunjukkan bahwa 20 mL larutan HCl 0,1 M mampu mendesorpsi Zn(II) sebesar 88,24% dari adsorben BM@SiO₂/K.

Kata kunci: Adsorpsi Zn(II), desorpsi, kitosan, silika, pasir besi

ADSORPTION-DESORPTION OF Zn(II) WITH CHITOSAN MODIFIED SILICA COATED ON IRON SAND MAGNETIC MATERIAL

An Nur Zajar
14/364427/PA/15997

ABSTRACT

Adsorption-desorption of Zn(II) with chitosan modified silica coated on iron sand magnetic material (BM@SiO₂/K) has been studied. Adsorbent was synthesized by sol gel method with 3-glycidoxypropyltrimethoxysilane (GPTMS) as grafting agent. Adsorbent was characterized by Fourier Transform Infrared (FTIR) Spectrophotometer, X-Ray Diffraction (XRD) and Scanning Electron Microscope-Energy Dispersive Spectrometer (SEM-EDX). Adsorption of Zn(II) ions was performed by variation of pH, contact time and initial concentration of Zn(II) ions. Desorption of Zn(II) ions was performed by variation of type desorption solution of HCl, HNO₃, KNO₃ and NaOH. The concentration of Zn(II) ions in solution before and after adsorption-desorption were analyzed by Atomic Absorption Spectroscopy (AAS).

The characterization results show that the magnetic material was successfully coated by SiO₂ and chitosan with GPTMS as grafting agent, has rough texture and irregular shape with crystallite size of 35.99 nm and adsorbent particle size of and 49.28, and N percentage of 7.35%. Adsorption of Zn(II) ions with BM@SiO₂/K optimum at pH 6, contact time of 90 minutes and initial concentration of Zn(II) is 50 ppm. Adsorption kinetics of Zn(II) ions follows second order pseudo model with an adsorption rate constant (k) of $5.6 \times 10^{-2} \text{ mg g}^{-1} \text{ min}^{-1}$. Isotherm adsorption of Zn(II) ions follows Langmuir isotherm model with Langmuir constant (K_L) $8.6 \times 10^{-2} \text{ L mg}^{-1}$ and the maximum adsorption capacity (q_m) of 12.76 mg g⁻¹. The desorption test showed that 20 mL HCl solution 0.1 M was capable to desorb Zn(II) of 88.24% from BM@SiO₂/K.

Keywords: adsorption Zn(II), desorption, chitosan, silica, iron sand