

PENGUNAAN HIBRIDA KITOSAN-SILIKA TERLAPIS PADA BAHAN MAGNETIK PASIR BESI UNTUK ADSORPSI-DESORPSI Pb(II)

Hermawan Ari Aji
14/364416/PA/15986

INTISARI

Penelitian penggunaan hibrida kitosan-silika terlapis pada bahan magnetik pasir besi (BM@SiO₂/K) untuk adsorpsi-desorpsi Pb(II) telah dilakukan. Dalam penelitian ini dilakukan adsorpsi Pb(II) untuk menentukan pH optimum, kinetika dan kapasitas adsorpsi Pb(II) pada BM@SiO₂/K, uji desorpsi, serta pengujiannya pada larutan sampel tanah penambangan emas Kulon Progo. Sintesis BM@SiO₂/K dilakukan dengan melapisi silika-kitosan pada bahan magnetik melalui metode sol-gel, yaitu mencampurkan bahan dasar pada perbandingan mol Na₂SiO₃ : kitosan : GPTMS 1:1:1. Produk hasil sintesis dikarakterisasi dengan spektrofotometer FT-IR, XRD dan SEM-EDX. BM@SiO₂/K digunakan untuk adsorpsi ion logam Pb(II) pada variasi pH, waktu dan konsentrasi larutan Pb(II). BM@SiO₂/K yang telah mengadsorpsi ion logam Pb(II) didesorpsi menggunakan HCl, Na₂EDTA dan NaOH. Berdasarkan kondisi optimum dilakukan adsorpsi ion logam Pb(II) dalam larutan sampel tanah pertambangan emas Kulon Progo. Kadar logam Pb(II) dalam larutan hasil sisa adsorpsi dianalisis dengan AAS.

Hasil karakterisasi menunjukkan bahwa SiO₂ dan kitosan berhasil terlapis pada bahan magnetik pembentukan BM@SiO₂/K. Adsorpsi Pb(II) optimum di pH 4 dan studi kinetika menunjukkan bahwa adsorpsi Pb(II) pada BM@SiO₂/K mengikuti model orde ke-2 semu dengan konstanta laju adsorpsi sebesar $1,86 \times 10^{-2}$ g/mg.menit. Isoterm adsorpsi mengikuti model isoterm Freundlich dengan kapasitas adsorpsi 102,94 mg/g. Desorpsi Pb(II) pada BM@SiO₂/K optimal menggunakan Na₂EDTA 0,1 M dengan persentase desorpsi 70,22%. Destruksi sampel tanah dengan kadar Pb 5,83% menghasilkan konsentrasi Pb(II) dalam larutan 254,71 mg/L. Konsentrasi adsorpsi Pb(II) oleh BM@SiO₂/K pada larutan sampel sebesar 16,18 mg/L dengan persentase desorpsi 19,28%.

Kata kunci: silika, kitosan, pasir besi, adsorpsi-desorpsi Pb(II)

THE USE OF CHITOSAN-SILICA HYBRID COATED ON IRON SAND MAGNETIC MATERIAL FOR ADSORPTION-DESORPTION OF Pb(II)

Hermawan Ari Aji
14/364416/PA/15986

ABSTRACT

The use of chitosan-silica hybrid coated on iron sand magnetic material (BM@SiO₂/K) for adsorption-desorption of Pb(II) has been studied. In this research, Pb(II) adsorption was conducted to determine optimum pH, kinetics and adsorption capacity of BM@SiO₂/K, desorption test, and its tested on Kulon Progo gold mining soil sample. Synthesis BM@SiO₂/K was carried out with coating silica-chitosan on magnetic material via the sol-gel method by mixing the base materials in a mole ratio of Na₂SiO₃ : chitosan : GPTMS 1:1:1. The synthesis product was characterized by FT-IR spectrophotometer, XRD and SEM-EDX. BM@SiO₂/K was used for adsorption of Pb(II) metal ion in variation of pH, time and concentration of Pb(II) solution. The BM@SiO₂/K which has adsorbed Pb(II) was treated using HCl, Na₂EDTA and NaOH to desorb the metal ion. Based on the best condition, Pb(II) adsorption was carried out in a solution of gold mining soil sample of Kulon Progo area. The content of Pb(II) solution after adsorption was analyzed by AAS.

The characterization results show that SiO₂ and chitosan are successfully superimposed on magnetic materials to produce BM@SiO₂/K. Adsorption of Pb(II) was optimum at pH 4 and adsorption kinetics studies showed that the adsorption of Pb(II) on the BM@SiO₂/K follows the model of pseudo-second order with the rate constant of 1.86×10^{-2} g/mg.min. The adsorption isotherm follows the Freundlich isotherm model with adsorption capacity of 102,94 mg/g. Desorption was optimum with Na₂EDTA 0.1 M with percent desorption of Pb(II) 70.22%. Destruction of soil sample with 5.83% of Pb result solution with Pb(II) concentration 254.71 mg/L. The adsorption concentration of Pb(II) by BM@SiO₂/K in the sample solution was 16.18 mg/L with percent desorption 19.28%.

Keywords: silica, chitosan, iron sand, adsorption-desorption of Pb(II)