

**SORPSI Au(III), Cu(II), DAN Zn(II) DALAM LARUTAN BATUAN
PERTAMBANGAN RAKYAT DI KULON PROGO DENGAN BAHAN
MAGNETIK PASIR BESI TERLAPIS SILIKA/KITOSAN**

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INTISARI

Penelitian adsorpsi-desorpsi Au(III), Cu(II), dan Zn(II) dalam larutan batuan pertambangan rakyat Kulon Progo dengan bahan magnetik pasir besi terlapis silika termodifikasi kitosan (BMSiK) telah dilakukan. Penelitian meliputi penentuan konsentrasi logam Au, Cu, dan Zn dalam sampel batuan; uji penggunaan ulang BMSiK untuk adsorpsi-desorpsi ion multi-logam Au(III)/Cu(II)/Zn(II) dengan konsentrasi mirip dalam larutan sampel; penentuan faktor prekonsentrasi Au(III); dan evaluasi selektivitas BMSiK terhadap Au(III). BMSiK setelah adsorpsi-desorpsi dikarakterisasi dengan *Fourier Transform Infrared* (FTIR) *Spectrophotometer*, *X-ray Diffraction* (XRD), *Scanning Electron Microscope-Energy Dispersive X-ray* (SEM-EDX), *Transmission Electron Microscopy* (TEM). Sampel batuan dilarutkan dengan akuaregia dan kandungan ion Au(III), Cu(II), dan Zn(II) dianalisis dengan *Atomic Absorption Spectroscopy* (AAS). Adsorpsi dilakukan dengan mencampurkan larutan ion logam dan BMSiK pada pH 3, suhu kamar, diaduk 200 rpm selama satu jam. Desorpsi dilakukan menggunakan larutan tiourea 6% dalam HCl 0,1 M dan BMSiK dipisahkan dengan batang magnet.

Hasil menunjukkan bahwa sampel batuan mengandung logam Au, Cu, Zn masing-masing $0,145 \pm 0,03$; $17,35 \pm 3,88$; dan $182,95 \pm 21,4$ mg/g. BMSiK dapat digunakan kembali untuk adsorpsi-desorpsi Au(III) sebanyak dua kali dengan *recovery* $80,93 \pm 1,44\%$. Faktor prekonsentrasi Au(III) dalam larutan ion multi logam Au(III)/Cu(II)/Zn(II) dengan BMSiK mencapai 25 kali dan *recovery* $82,57 \pm 1,45\%$. Hasil adsorpsi-desorpsi ion logam dalam larutan batuan dengan BMSiK diperoleh *recovery* Au(III), Cu(II) dan Zn(II) masing-masing $77,49 \pm 0,96$; $0,21 \pm 0,00$; dan $0,04 \pm 0,01\%$ dengan koefisien selektivitas, $\alpha_{\text{Au/Cu}}$ dan $\alpha_{\text{Au/Zn}}$ masing-masing $7,71 \pm 1,28$ dan $29,48 \pm 15,11$.

Kata kunci: adsorpsi, kitosan, silika, bahan magnetik, emas

SORPTION OF Au(III), Cu(II), AND Zn(II) IN SOLUTION OF THE GOLD MINING ROCK IN KULON PROGO WITH IRON SAND MAGNETIC MATERIAL COATED SILICA/CHITOSAN

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ABSTRACT

In this research sorption of Au(III), Cu(II), and Zn(II) from the solution of the gold mining rock in Kulon Progo with iron sand magnetic material coated silica/chitosan (MMSiC) has been conducted. The research included analysis of Au, Cu, and Zn in the sample; examination of the reusability-of MMSiC for sorption of metal ions in the multi-metallic solution of Au(III)/Cu(II)/Zn(II) with the concentration similar to that in sample solution; determination of pre-concentration factor of Au(III), and selectivity coefficient of MMSiC against Au(III). MMSiC after adsorption-desorption was characterized by Fourier Transform Infrared (FTIR) Spectrophotometer, X-ray Diffraction (XRD), Scanning Electron Microscope-Energy Dispersive X-ray (SEM-EDX), Transmission Electron Microscopy (TEM). The rock sample was dissolved with aquaregia and the content of Au(III), Cu(II), and Zn(II) was analyzed by Atomic Absorption Spectroscopy (AAS). Adsorption was performed by mixing the metal ion solution and MMSiC at pH 3, a room temperature, shaken 200 rpm for one hour. Desorption was conducted with solution of 6% thiourea in 0.1 M HCl. MMSiC after adsorption-desorption was separated with an external magnetic bar.

The result showed that rock sample contained of Au, Cu, and Zn was 0.145 ± 0.03 , 17.35 ± 3.88 ; and 182.95 ± 21.41 mg/g, respectively. MMSiC could be reuseable two times for adsorption-desorption of Au(III) ion with recovery of $80.93 \pm 1.44\%$. Pre-concentration of Au(III) in multi-metallic solution of Au(III)/Cu(II)/Zn(II) with MMSiC reached the pre-concentration factor of 25 times and recovery of $82.57 \pm 1.45\%$. The result of adsorption-desorption of metal ions in the rock sample solution was obtained recovery of 77.49 ± 0.96 , 0.21 ± 0.00 ; and $0.04 \pm 0.01\%$ for Au(III), Cu(II) and Zn(II), respectively, with selectivity coefficient, $\alpha_{Au/Cu}$ of 7.71 ± 1.28 and $\alpha_{Au/Zn}$ of 29.48 ± 15.11 .