



ADSORPSI Au(III) PADA MATERIAL MAGNETIK PASIR BESI TERLAPIS SILIKA TERMODIFIKASI ETILENDIAMINA

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INTISARI

Telah dilakukan penelitian adsorpsi Au(III) pada material magnetik pasir besi (PB) yang terlapis silika (SiO_2) termodifikasi gugus fungsi etilendiamina (ED) yang kemudian disebut PB@ SiO_2 @ED. Sumber silika yang digunakan adalah larutan natrium silikat (Na_2SiO_3) dan sumber etilendiamina yang ditambahkan adalah 3-etilendiaminapropiltrimetoksisilan (EDPTMS).

Pelapisan dilakukan dengan mencampur 0,5 g material magnetik pasir besi dengan 2 mL larutan Na_2SiO_3 (26,5% SiO_2 ; 10,6% Na_2O) dan 1 mL EDPTMS, serta ditambahkan larutan HCl 1 M hingga terbentuk gel pada pH 7. Hasil sintesis dikarakterisasi dengan *Fourier Transform Infrared (FTIR) Spectrophotometer*. Material yang telah disintesis diaplikasikan untuk adsorpsi logam Au(III) dalam sistem larutan dengan beberapa variasi perlakuan seperti pH, waktu kontak, dan variasi konsentrasi. Kajian karakteristik adsorpsi Au(III) pada PB@ SiO_2 @ED meliputi penentuan tetapan laju adsorpsi pada beberapa model kinetika dan penentuan kapasitas adsorpsi dan energi adsorpsi dengan menggunakan model isoterm adsorpsi Langmuir dan Freundlich.

Hasil karakterisasi menggunakan spektrofotometer FTIR menunjukkan adanya pita serapan spesifik gugus fungsi PB@ SiO_2 @ED berupa Fe-O, Si-O-Si, Si-OH, N-H, dan C-H. Aplikasinya dalam adsorpsi Au(III) menghasilkan kondisi optimum yaitu pH 3 dan waktu kontak 150 menit. Kinetika adsorpsi Au(III) pada PB@ SiO_2 @ED mengikuti reaksi orde dua dengan nilai k sebesar $3 \times 10^{-5} \text{ L mg}^{-1} \text{ min}^{-1}$ dan pola isoterm adsorpsi mengikuti model isoterm Langmuir dengan kapasitas adsorpsi (q_{maks}) sebesar 140,845 mg/g dan energi adsorpsi sebesar 23,809 kJ/mol.

Kata kunci: pasir besi, silika, etilendiamina, adsorpsi

ADSORPTION OF Au(III) ON MAGNETIC MATERIAL OF IRON SAND COATED WITH ETHYLENEDIAMINE MODIFIED SILICA

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ABSTRACT

Adsorption of Au(III) on iron sand (PB) magnetic material coated with silica (SiO₂) modified using ethylenediamine (ED) group (PB@SiO₂@ED) was done. Sodium silicate solution (Na₂SiO₃) was used as silica source and N-[3-(trimethoxysilyl)propyl]ethylenediamine (EDPTMS) as ethylenediamine source.

The coating was carried out by mixing 0.5 g of magnetic material, obtained from iron sand, with 2 mL of Na₂SiO₃ solution (26.5% SiO₂; 10.6% Na₂O) and 1 mL of EDPTMS, followed by addition of HCl solution to form gel at pH 7. The synthesized materials were characterized by Fourier Transform Infrared (FTIR) spectrophotometer. Experimental parameters affecting Au(III) adsorption onto PB@SiO₂@ED includes pH, contact time, and initial concentration were investigated. Characteristic of PB@SiO₂@ED for adsorption included determination of rate constant of adsorption on several kinetic models and determination capacity and energy of adsorption using models of Langmuir and Freundlich adsorption isotherms were evaluated.

The characterization with FTIR spectrophotometer showed there were specific absorption bands of functional groups from PB@SiO₂@ED such as Fe-O, Si-O-Si, Si-OH, N-H, and C-H. Adsorption of Au(III) on PB@SiO₂@ED was optimum at pH of 3 and contact time of 150 minutes. The rate constant of adsorption was $3 \times 10^{-5} \text{ L mg}^{-1} \text{ min}^{-1}$. The adsorption followed the second order kinetics. The capacity and energy of adsorption were 140.845 mg/g and 23.809 kJ/mol and followed Langmuir isotherm model.

Keywords: iron sand, silica, ethylenediamine, adsorption