IMOBILISASI DITIZON PADA ABU LAYANG BATUBARA DALAM MEDIUM BASA UNTUK ADSORPSI ION LOGAM Ag(I)

DELLA FRIZKI BILLIANI

20/466448/PPA/06014

INTISARI

Telah dilakukan penelitian tentang imobilisasi ditizon pada abu layang batubara PLTU Tanjung, Muara Enim, Sumatera Selatan, yang digunakan sebagai adsorben dalam adsorpsi ion logam Ag(I). Penelitian ini dimulai dengan mengaktivasi abu layang batubara menggunakan HCl 6 M. Abu layang teraktivasi kemudian digunakan untuk imobilisasi ditizon pada permukaannya dalam medium air/basa (NaOH). Karakterisasi abu layang batubara teraktivasi dan terimobilisasi ditizon dilakukan dengan menggunakan *Fourier Transform Infra-red* (FT-IR) dan *X-Ray Diffraction* (XRD). Abu layang teraktivasi dan terimobilisasi ditizon selanjutnya digunakan dalam studi adsorpsi ion Ag(I) dalam larutan. Dalam kajian adsorpsi dipelajari parameter yang mempengaruhi adsorpsi, meliputi pengaruh keasaman (pH), massa adsorben, waktu kontak dan kinetika adsorpsinya, serta konsentrasi awal ion logam dan isotherm adsorpsi ion logam Ag(I). Mekanisme adsorpsi dipelajari melalui desorpsi sekuensial dengan menggunakan pelarut akuabides, KNO_3, $HONH_2HCl$ dan NA_2EDTA. Konsentrasi setiap ion logam yang tersisa dalam larutan setelah adsorpsi dan desorpsi ditentukan dengan menggunakan spektrofotometer serapan atom (SSA).

Hasil penelitian menunjukkan bahwa ditizon telah terimobilisasi pada permukaan abu layang batubara teraktivasi sesuai dengan hasil karakterisasi menggunakan FTIR dan XRD dan proses imobilisasi tidak merusak kristalinitas abu layang batubara. Kondisi optimum adsorpsi abu layang batubara teraktivasi dan abu layang terimobilisasi ditizon terhadap ion logam Ag(I) berada pada pH 6 dengan massa adsorben 0,02 g, waktu kontak 45 menit, serta konsentrasi awal Ag(I) sebesar 100 ppm. Kinetika adsorpsi ion Ag(I) pada abu layang teraktivasi dan terimobilisasi ditizon mengikuti *pseudo* orde dua dengan nilai konstanta laju (k) berturut-turut 0,113 dan 0,709 g mg^{-1} $menit^{-1,}$ Adsorpsi ion Ag(I) mengikuti model isotherm Langmuir dengan kapasitas adsorpsi abu layang teraktivasi dan terimobilisasi ditizon berturut-turut yaitu $2,39 \times 10^{-4}$ dan $3,64 \times 10^{-4}$ mol g^{-1} yang melibatkan energi adsorpsi berturut-turut 22,52 dan 25,11 kJ $mol^{-1,}$ Hasil kajian desorpsi sekuensial menunjukkan mekanisme adsorpsi ion Ag(I) pada abu layang teraktivasi terjadi melalui pertukaran ion, sedangkan adsorpsi ion Ag(I) pada abu layang imobilisasi ditizon terjadi melalui pembentukan senyawa kompleks.

Kata kunci: abu layang batubara, adsorpsi, ion logam Ag(I), ditizon, kinetika, isoterm

IMMOBILIZATION OF DITHIZONE ON COAL FLY ASH ON BASE MEDIUM FOR THE ADSORPTION OF Ag(I) METAL ION

DELLA FRIZKI BILLIANI

20/466448/PPA/06014

ABSTRACT

The study of dithizone immobilization on coal fly ash from electric power plant (PLTU), Tanjung, Muara Enim, South Sumatera as adsorbent of Ag(I) metal ion has been conducted. The research was started by activating the coal fly ash using 6 M HCl. The activated fly ash was then used for immobilization of dithizone on its surface in the medium of NaOH solution. Characterization of the activated and dithizone-immobilized coal fly ash was done by using Fourier Transform Infra Red (FTIR) spectroscopy and X-Ray diffraction (XRD) analysis. The activated and dithizone-immobilized coal fly ash were used in adsorption of Ag(I) ion in solution. In the adsorption study, the parameters influencing the adsorption including pH, mass of adsorbent, interaction time and its adsorption kinetics as well as initial metal concentration and its adsorption isotherm models of Ag(I) metal ion were investigated. The sequential desorption to understand the mechanisms of adsorption by using double-distilled water (H_2O), KNO_3, $HONH_2HCl$ and Na_2EDTA. The concentration of Ag(I) ion remaining in the solution after adsorption and desorption was determined using atomic absorption spectrophotometer (AAS).

The result showed that dithizone has been successfully immobilized on the active surface of coal fly ash as indicated by the characterization using FTIR and XRD, where the immobilization process did not damage the crystallinity of fly ash. The optimum conditions for Ag(I) adsorption using activated and dithizone-immobilized fly ash are at pH 6 with 0,02 of adsorbent mass, contact time of 45 min and initial concentration of Ag(I) 100 ppm. The kinetic adsorption of Ag(I) ions on activated and ditizhone- immobilized fly ash follows the pseudo-second order kinetics model with rate constant (k) of 0,113 dan 0,709 g mg^{-1} min^{-1}, respectively. The adsorption isotherm of Ag(I) on activated coal fly ash and dithizone-immobilized fly ash follows Langmuir model with the adsorption capacity respectively of 2,39 x 10^{-4} and 3,64 x 10^{-4} mol g^{-1} involving the adsorption energy of 22,52 dan 25,11 kJ mol^{-1} respectively. Based on sequential adsorption experiments, it is revealed that the adsorption mechanism of Ag(I) metal ions on activated coal fly ash is dominated by ion-exchange interaction. Meanwhile, adsorption mechanism of Ag(I) metal ion on dithizone-immobilized coal fly ash occurs through the formation of metal complexation.

Keywords: coal fly ash, adsorption, metal ion Ag(I), dithizone, kinetics, isotherm.