LIMBAH *SLAG* NIKEL TERIMOBILISASI DITIZON SEBAGAI ADSORBEN ION Ag(I) DAN Co(II)

Muhammad Luqman
19/448765/PPA/05848

INTISARI

Kajian kemampuan adsorpsi *slag* nikel terimobilisasi ditizone terhadap ion Ag(I) dan Co(II) telah dilakukan dengan sistem batch. Penelitian ini meliputi sintesis dan karakterisasi *slag* nikel teraktivasi dan terimobilisasi ditizon, optimasi parameter uji adsorpsi, dan desorpsi ion logam untuk mempelajari mekanisme adsorpsi. *Slag* nikel teraktivisasi disintesis dari *slag* nikel alam yang direaksikan dengan HCl pekat, sedangkan *slag* nikel terimobilisasi ditizon disintesis dari *slag* nikel aktivasi yang direaksikan dengan ditizon dalam pelarut toluene. Adsorben yang telah disintesis dikarakterisasi menggunakan FTIR, XRD dan SEM-EDX. Beberapa parameter yang telah dipelajari terhadap adsorpsi ion Ag(I) dan Co(II) diantaranya: pH larutan, massa adsorben, waktu interaksi dan kinetika adsorpsi serta konsentrasi awal ion logam dan isoterm adsorpsi.

Kondisi optimum pada adsorpsi ion Ag(I) adalah pada pH larutan 5, massa adsorben 0,2 g, waktu interaksi 90 menit dan konsentrasi awal ion Ag(I) sebesar 70 ppm. Adsorpsi ion Co(II) mencapai kondisi optimum pada pH larutan 5, massa adsorben 0,3 g, waktu interaksi 120 menit, dan konsentrasi awal ion Co(II) sebesar 50 ppm. Kinetika adsorpsi dari ion Ag(I) dan Co(II) mengikuti model kinetika orde kedua semu dengan harga konstanta laju (k) untuk Ag(I) berturut-turut 8,333 dan 13,776 g mg^{-1} $menit^{-1}$ untuk *slag* nikel teraktivasi dan terimobilisasi ditizon, sedangkan untuk Co(II) berturut-turut 0,633 dan 0,623 g mg^{-1} $menit^{-1}$. Adsorpsi ion Ag(I) dan Co(II) mengikuti model isoterm Langmuir dengan kapasitas adsorpsi ion Ag(I) pada *slag* nikel teraktivasi dan *slag* nikel terimobilisasi adalah $1{,}256 \times 10^{-5}$ dan $1{,}698 \times 10^{-5}$ mol g^{-1}, sedangkan pada ion Co(II) berturut-turut $1{,}236 \times 10^{-5}$ dan $1{,}441 \times 10^{-5}$. Kajian desorpsi pada *slag* nikel aktivasi dominasi oleh interaksi pertukaran ion, sedangkan pada *slag* nikel terimobilisasi ditizon didominasi oleh ikatan hidrogen dan kompleksasi. Secara keseluruhan, terlihat dengan jelas bahwa kemampuan adsorpsi *slag* nikel terimobilisasi terhadap kedua logam lebih tinggi dibandingkan *slag* nikel yang tidak terimmobilisasi.

Kata kunci: adsorpsi, Ag(I), Co(II), ditizon, *slag* nikel

DITHIZONE IMMOBILIZED NICKEL SLAG WASTE AS ADSORBENT FOR Ag(I) AND Co(II) METAL IONS

Muhammad Luqman
19/448765/PPA/05848

ABSTRACT

A study on the adsorption ability of dithizone immobilized nickel slag waste onto Ag(I) and Co(II) ions has been carried out using a batch system. This research includes the synthesis and characterization of activated and immobilized nickel slag, optimization of adsorption test parameters, and desorption of metal ions to study the adsorption mechanism. Activated nickel slag was synthesized from natural nickel slag which was reacted with concentrated HCl, while dithizone immobilized nickel slag was synthesized from activated nickel slag which was reacted with dithizone in toluene solvent. The synthesized adsorbents were characterized using FTIR, XRD and SEM-EDX. Several parameters that have been studied on the adsorption of Ag(I) and Co(II) metal ions include: pH of solution, mass of adsorbent, interaction time and adsorption kinetics as well as initial concentration of metal ions and adsorption isotherm.

The optimum conditions for the adsorption of Ag(I) ion were at a solution pH of 5, adsorbent mass of 0.2 g, interaction time of 90 minutes and initial concentration of Ag(I) ion of 70 ppm. Whereas, the optimum conditions for the adsorption of Co(II) ion were at pH of 5, adsorbent mass of 0.3 g, interaction time of 120 minutes, and initial concentration of Co(II) ion of 50 ppm. The adsorption kinetics of Ag(I) and Co(II) ions followed a pseudo second-order kinetics model with the rate constant (k) for Ag(I) are 8.333 and 13.776 g mg^{-1} min^{-1} for activated and immobilized nickel slag, while for Co(II) was 0.633 and 0.623 g mg^{-1} min^{-1} respectively. The adsorption of Ag(I) and Co(II) ions followed the Langmuir isotherm model with adsorption capacity for Ag(I) are 1.256×10^{-5} and 1.698×10^{-5} mol g^{-1} for activated and immobilized by dithizone nickel slag, while for Co(II) was 1.236×10^{-5} and 1.441×10^{-5}, respectively. The study of desorption on activated nickel slag was dominated by ion exchange interactions, while on dithizone immobilized nickel slag was dominated by hydrogen bonding and complexation. It is clearly showed that the adsorption ability of immobilized nickel slag on both metals is higher than that of unimmobilized one.

Keywords: adsorption, Ag(I), Co(II), dithizone, nickel slag