

IMOBILISASI DITIZON PADA SILIKA GEL BERBAHAN DASAR PASIR PANTAI PARANGKUSUMO DAN APLIKASINYA UNTUK ADSORPSI ION Pb(II)

Canesha Louise Putri Yantati
22/505065/PA/21738

INTISARI

Penelitian mengenai imobilisasi senyawa ditizon pada silika gel berbahan dasar pasir Pantai Parangkusumo serta aplikasinya untuk adsorpsi ion Pb(II) telah dilakukan. Penelitian meliputi sintesis silika gel, imobilisasi ditizon, dan aplikasinya sebagai adsorben ion Pb(II). Kajian adsorpsi dilakukan melalui variasi pH, waktu kontak, massa adsorben, dan konsentrasi awal adsorbat untuk menentukan kondisi optimum serta model kinetika dan isoterm adsorpsi.

Penelitian diawali dengan preparasi dan aktivasi pasir Pantai Parangkusumo menggunakan HCl, kemudian disintesis menjadi silika gel (SG) melalui metode peleburan alkali dengan NaOH dan diimobilisasi dengan ditizon menjadi silika terimobilisasi ditizon (SGD). Material hasil sintesis dikarakterisasi menggunakan Spektrometer Fluoresensi sinar-X (XRF), Spektroskopi Inframerah (FT-IR), Difraksi Sinar-X (XRD), dan Mikroskop Pemindai Elektron (SEM). Konsentrasi Pb(II) sebelum dan sesudah adsorpsi dianalisis menggunakan Spektrofotometer Serapan Atom (AAS).

Hasil penelitian menunjukkan bahwa sintesis SG dari pasir Pantai Parangkusumo dan imobilisasi ditizon menjadi SGD telah berhasil dilakukan. Kondisi optimum adsorpsi Pb(II) pada SG dan SGD tercapai pada pH 4, dengan massa adsorben berturut-turut 7,5 dan 5 mg, waktu kontak 45 dan 15 menit, serta konsentrasi awal 20 dan 80 mg L⁻¹. Proses adsorpsi mengikuti model kinetika pseudo-orde dua dengan konstanta laju masing-masing 0,0289 dan 0,163 g mg⁻¹ menit⁻¹ serta model isoterm Langmuir dengan kapasitas maksimum masing-masing 32,573 dan 71,942 mg g⁻¹ untuk SG dan SGD. Imobilisasi ditizon pada SG terbukti dapat meningkatkan kapasitas adsorpsi, dengan SGD menunjukkan kapasitas lebih tinggi dibanding SG.

Kata kunci: adsorpsi, ditizon, ion logam Pb(II), pasir pantai, silika gel

***IMMOBILIZATION OF DITHIZONE ON SILICA GEL PREPARED
FROM PARANGKUSUMO BEACH SAND AND ITS APPLICATION AS
ADSORBENT OF Pb(II)***

Canesha Louise Putri Yantati
22/505065/PA/21738

ABSTRACT

This study examined the immobilization of dithizone on silica gel prepared from Parangkusumo Beach sand and its application in the adsorption of Pb(II) ions. The research encompassed the synthesis of silica gel, the immobilization of dithizone, and the use of the resulting material as an adsorbent for Pb(II) ions. The adsorption study was conducted by varying pH, contact time, adsorbent mass, and initial adsorbate concentration to determine the optimum conditions, as well as the kinetic and isotherm models of adsorption.

The study began with the preparation and activation of Parangkusumo Beach sand using HCl, followed by its synthesis into silica gel via the alkali fusion method with NaOH and immobilization with dithizone. The synthesized material was characterized using X-ray Fluorescence Spectroscopy (XRF), Fourier-Transform Infrared Spectroscopy (FT-IR), X-ray Diffraction (XRD), and Scanning Electron Microscopy (SEM). The Pb(II) concentrations before and after adsorption were analyzed using Atomic Absorption Spectroscopy (AAS).

The results showed that the synthesis of silica gel (SG) from Parangkusumo Beach sand and the immobilization of dithizone on silica gel (SGD) were successfully achieved. The optimal conditions for Pb(II) adsorption on SG and SGD were pH 4, with adsorbent masses of 7.5 and 5 mg, contact times of 45 and 15 minutes, and initial concentrations of 20 and 80 mg L⁻¹, respectively. The adsorption process followed the pseudo-second-order kinetic model, with rate constants of 0.0289 and 0.163 g mg⁻¹ min⁻¹ for SG and SGD, respectively, and the Langmuir isotherm model, with maximum adsorption capacities of 32.573 and 71.942 mg g⁻¹ for SG and SGD, respectively. The immobilization of dithizone on SG was shown to enhance the adsorption capacity, with SGD exhibiting a higher capacity than SG.

Keywords: adsorption, beach sand, dithizone, Pb(II) metal ion, silica gel