ADSORPSI ION Pb(II) MENGGUNAKAN BENTONIT ALAM DAN KOMERSIAL YANG DIIMOBILISASI DITIZON

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INTISARI

Adorpsi ion Pb(II) menggunakan bentonit alam teraktivasi (BAA), bentonit komersial teraktivasi (BKA), bentonit alam yang diimobilisasi dengan ditizon (BAID), dan bentonit komersial yang diimobilisasi dengan ditizon (BKID) telah berhasil dilakukan. Aktivasi bentonit alam dan komersial dilakukan dengan mencampurkan masing-masing bentonit dengan larutan HCl 4 M. Imobilisasi ditizon dilakukan dengan mencampurkan bentonit teraktivasi dan ditizon dalam pelarut toluena disertai pengadukan dan pemanasan pada suhu 50 ^{o}C selama 4 jam. Imobilisasi ditizon pada permukaan bentonit bertujuan untuk meningkatkan selektivitas dan kapasitas adsorben terhadap ion logam. Bentonit teraktivasi dan terimobilisasi ditizon dikarakterisasi menggunakan FTIR dan XRD.

Hasil karakterisasi menunjukkan bahwa ditizon telah berhasil diimobilisasi pada permukaan bentonit alam dan komersial. Kondisi optimum pada keempat jenis adsorben dalam adsorpsi ion Pb(II) terjadi pada pH 5 dengan 0,1 g massa adsorben, konsentrasi awal 70 ppm dan waktu interaksi 60 menit. Hasil penelitian menunjukkan bahwa adsorpsi ion Pb(II) pada keempat jenis adsorben cenderung mengikuti model kinetika adsorpsi orde ke-2 semu dan isoterm Langmuir. Berdasarkan hasil perhitungan, kapasitas dan energi adsorpsi ion Pb(II) pada BAA, BAID, BKA, dan BKID masing-masing adalah 1,719; 3,349; 0,668; 2,156 mg/g dan 27,172; 29,592; 30,997; 32,845 kJ/mol. Interaksi BAA dan BKA dengan ion Pb(II) didominasi oleh interaksi pertukaran ion/elektrostatik (67,6% dan 63,6%). Selanjutnya, interaksi BAID dan BKID didominasi oleh interaksi pertukaran ion/elektrostatik (39,9% dan 40,4%) dan pembentukan kompleks (40,4% dan 35,4%).

Kata kunci: bentonit, ditizon, imobilisasi, ion Pb(II), adsorpsi

ADSORPTION OF Pb(II) ION ON NATURAL AND COMMERCIAL BENTONITES IMMOBILIZED BY DITHIZONE

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ABSTRACT

Adsorption of Pb(II) using activated natural bentonite (BAA), activated commercial bentonite (BKA), natural bentonite immobilized by dithizone (BAID), and commercial bentonite immobilized by dithizone (BKID) was successfully carried out. Natural and commercial bentonite was activated by mixing each bentonite with 4 M HCl solution. The imobilization of bentonite was carried out by mixing each bentonite and dithizone using toluene solvent accompanied by stirring and heating at 50 ^{0}C for 4 hours. The Immobilization of dithizone is aimed to increase the selectivity and capacity of adsorbents towards Pb(II) ions. Activated and dithizone-immobilized bentonite were then characterized using FTIR and XRD.

The characterization results show that dithizone has been immobilized on the surface of natural and commercial bentonite. The optimum condition on the four types of adsorbents in the adsorption of Pb(II) ions occurred at pH 5 with 0.1 g of mass of adsorbent, initial concentration of 70 ppm and interaction time of 60 minutes. Experimental result show that the adsorption of Pb(II) follow the pseudo second order kinetics model and the Langmuir isotherm model for four types of the adsorbents. Based on the calculation results, the capacity and energy of adsorption of Pb(II) ions in BAA, BAID, BKA, and BKID are respectively 1.719; 3.349; 0.668; 2.156 mg/g and 27.172; 29.592; 30.997; 32.845 kJ/mol. The interaction of BAA and BKA with Pb(II) is dominated by ion exchange/electrostatic interactions (67.6% and 63.6%). Furthermore, the interaction of BAID and BKID was dominated by ion exchange/electrostatic interactions (39.9% and 40.4%) and complexation (40.4% and 35.4%).

Keywords: bentonite, dithizone, immobilization, Pb(II) ions, adsorption