

SINTESIS SILIKA GEL DARI ABU VULKANIK GUNUNG KELUD DENGAN ASAM KLOORIDA (HCl) DAN UJI ADSORPSIVITASNYA TERHADAP ION LOGAM KROMIUM(VI) DAN TIMBAL(II)

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ABSTRAK

Penelitian ini bertujuan untuk mengetahui konsentrasi maksimum asam klorida yang digunakan untuk sintesis silika gel, mengetahui karakteristik gugus fungsi, keasaman, dan kadar air silika gel hasil sintesis serta mengetahui besarnya efisiensi penjerapan silika gel hasil sintesis terhadap ion logam kromium(VI) dan timbal(II).

Subjek dari penelitian ini adalah abu vulkanik Gunung Kelud dan objeknya adalah karaktersilika gel hasil sintesis dari abu Vulkanik Gunung Kelud meliputi keasaman, kadar air, spektra inframerah, dan efisiensi penjerapan terhadap ion logam kromium(VI) dan timbal(II). Sintesis silika gel dilakukan dengan metode sol-gel, yaitu dengan menambahkan asam klorida 1, 2, dan 3M ke dalam 20mL natrium silikat disertai pengadukan sampai pH 7, didiamkan selama 18 jam, dicuci dengan akuademineralisata hingga netral, dikeringkan dalam oven 120°C selama 2 jam dan digerus hingga lolos ayak 100 mesh. Adsorpsi silika gel dilakukan dengan memasukkan silika gel ke dalam larutan ion logam kromium(VI) dan timbal(II), kemudian di kocok menggunakan *shacker* selama 90 menit, disentrifgasi selama 30 menit dengan kecepatan 2000 rpm untuk memisahkan dengan endapan. Larutan sisa dianalisis dengan spektrofotometer serapan atom untuk mengetahui jumlah ion logam kromium(VI) dan timbal(II) yang tidak teradsorpsi kedalam silika gel. Hasil dibandingkan dengan silika gel pembeding, kiesel gel 60G Merck.

Hasil penelitian menunjukkan bahwa konsentrasi maksimum asam klorida untuk sintesis adalah 3M dengan efisiensi produksi sebesar 27,55%[b/b]. Silika gel hasil sintesis yaitu SG-HCl 1M, SG-HCl 2M, SG-HCl 3M memiliki karakter yang hampirsama dengan Kiesel gel 60G sebagai silika gel pembeding. Nilai keasaman Kiesel gel 60G, SG-HCl 1M, SG-HCl 2M, SG-HCl 3M berturut-turut 3,5500; 3,0944; 2,9170; 3,0944 mmol/g dan kadar air 6,33; 15,00; 13,00; 13,67 %. Efisiensi penjerapan terhadap ion logam Cr(VI) berturut-turut 6,03; 11,69; 12,01; 15,48 % sedangkan efisiensi penjerapan terhadap ion logam Pb(II) berturut-turut 66,21; 90,46; 95,35; 93,83 %.

Kata Kunci: Adsorpsi, abu vulkanik Gunung Kelud, Silika gel, kromium(VI), timbal(II)

SYNTHESIS SILICA GEL FROM KELUD VOLCANIC ASH USING HYDROCHLORIC ACID (HCl) AND TESTING OF CHROMIUM(VI) AND LEAD(II) ADSORPTION

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ABSTRACT

The aims of this research are to find out the maximum concentration of hydrochloric acid that used to synthesizing silica gel; find out the characteristics of functional groups, acidity, and the water content of the synthesized silica gel; and determine the adsorption efficiency of silica gel on metal ions chromium(VI) and lead(II).

The subject of this research was Kelud volcanic ash and the objects were the characteristics of the synthesized silica gel including acidity, water content, infrared spectra, and chromium(VI) and lead(II) adsorption efficiency. Silica gel was synthesized using the sol-gel method, with adding hydrochloric acid 1, 2, and 3M into 20 mL of sodium silicate while stirring until reaching the desired acidity level, pH 7, and then it was allowed to stand for 18 hours. After that, it was neutralized using aquademineralisata, then allowed to dry in a 120°C oven for 2 hours and crushed until it could pass the 100 *mesh* sieve. Silica gel adsorption testing was completed by mixing the silica gel into a solution of metal ions of chromium(VI) and lead(II), then the solution was beaten using a shaker for 90 minutes, centrifuged for 30 minutes at 2000 rpm to separate the precipitate. The remaining solution was analyzed using atom absorption spectrophotometer to determine the amount of metal ions of chromium(VI) and lead(II) which not adsorbed by the silica gel. The result is comparized by kiesel gel 60G Merck.

The results showed that the maximum concentration of hydrochloric acid used to synthesize the silica gel was 3M with production efficiency of 27.55% [w/w]. Synthesized silica gel results, SG-HCl 1M, 2M HCl SG-SG-HCl 3M, has similar characteristics with kiesel gel 60G, which was used as comparison. The acidity level of kiesel gel 60G, SG-HCl 1M, SG-HCl 2M, SG-HCl 3M are 3.5500; 3.0944; 2.9170; 3.0944 mmol/g respectively and the water content of the silica gel are 6.33; 15.00; 13.00; 13.67% respectively. The adsorption efficiency of the metal ions of Cr(VI) were 6.03; 11.69; 12.01; 15.48 % respectively while the adsorption efficiency of Pb(II) were 66.21; 90.46; 95.35; 93.83% respectively.

Keywords: Adsorption, Kelud volcanic ash, silica gel, chromium(VI), lead(II)