



SINTESIS KOMPOSIT ZEOLIT-MAGNETIT SEBAGAI ADSORBEN ION LOGAM Co(II)

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INTISARI

Sintesis komposit zeolit-magnetit dan aplikasinya untuk adsorpsi ion logam Co(II) telah dilakukan. Tujuan penelitian adalah sintesis komposit zeolit-magnetit dan mengkaji kinerja adsorben zeolit-magnetit untuk mengadsorpsi Co(II) dalam air. Komposit zeolit-magnetit disintesis dari zeolit alam dengan magnetit, campuran larutan $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ dan larutan $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$. Sintesis dilakukan pada temperatur 85 °C dengan penambahan NH_4OH hingga pH 11. Komposit zeolit-magnetit hasil sintesis selanjutnya dikarakterisasi menggunakan FTIR (*Fourier Transform Infrared Spectroscopy*), XRD (*X-Ray Diffraction*), dan SAA (*Surface Area Analyzer*). Komposit zeolit-magnetit hasil sintesis digunakan untuk mengadsorpsi ion logam Co(II), setelah proses adsorpsi kemudian dilakukan uji *recovery*. Banyaknya ion logam Co(II) yang teradsorpsi pada komposit zeolit-magnetit dianalisis dengan AAS (*Atomic Adsorption Spectroscopy*).

Hasil penelitian menunjukkan bahwa kesetimbangan adsorpsi ion logam Co(II) tercapai dalam waktu 120 menit. Kinetika adsorpsi ion logam Co(II) memenuhi aturan dari Ho yang merupakan kinetika adsorpsi orde dua semu dan memiliki harga konstanta laju sebesar $0,0301 \text{ g mg}^{-1} \text{ menit}^{-1}$. Adsorpsi ion logam Co(II) pada komposit zeolit-magnetit mengikuti termodinamika adsorpsi model Langmuir dengan kapasitas adsorpsi sebesar $23,47 \text{ mg g}^{-1}$ dan energi adsorpsi sebesar $19,85 \text{ kJ mol}^{-1}$. Uji *recovery* menunjukkan bahwa adsorben komposit zeolit-magnetit setelah proses adsorpsi dapat dipisahkan lebih cepat menggunakan medan magnet eksternal dibanding pemisahan yang hanya bergantung pada gaya gravitasi.

Kata kunci: zeolit alam, zeolit-magnetit, orde reaksi, konstanta laju, kapasitas adsorpsi



SYNTHESIS OF ZEOLITE-MAGNETITE COMPOSITE AS ADSORBENT OF Co(II) METAL ION

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ABSTRACT

Synthesis of zeolite-magnetite composite and its application for adsorption of Co(II) metal ion had been carried out. The aim of this research is to synthesize zeolite-magnetite composite and study the activity of zeolite-magnetite adsorbent to adsorb Co(II) in water. Zeolite-magnetite composite was synthesized from natural zeolite with magnetite, mixed of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ and $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$. Synthesis was conducted by coprecipitation method at 85°C and pH 11. The product was characterized using Fourier transform infrared spectroscopy, X-ray diffractometry, and Surface area analyzer. The product was then used to adsorb Co(II) metal ion, after adsorption process conducted recovery test. Co(II) metal ion that adsorbed on zeolite-magnetite composites was analyzed using AAS.

The result showed that adsorption equilibrium of Co(II) metal ion reached at 120 minutes, adsorption kinetic of Co(II) metal ion applied the rule of Ho as second pseudo order and rate constant of $0.0301 \text{ g mg}^{-1} \text{ min}^{-1}$. Co(II) metal ion adsorption on zeolite-magnetite composite followed the Langmuir's adsorption mode with adsorption capacity of 23.47 mg g^{-1} and adsorption energy of $19.85 \text{ kJ mol}^{-1}$. The recovery test showed zeolite-magnetite composites adsorbent after adsorption process can be separated more rapid using an external magnetic field rather than segregation that depends only on the force of gravity.

Keywords: natural zeolite, zeolite-magnetite, order reaction, the rate constant of adsorption, adsorption capacity