

Sintesis dan karakterisasi zeolit NaY dari zeolit alam bayat sebagai adsorben ion logam berat kadmium (II) dan kobalt (II) = Synthesis and characterization NaY zeolite from natural zeolite bayat as adsorbent of heavy metal ions cadmium (II) and cobalt (II)

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Abstrak

Sintesis zeolit NaY dari zeolit alam Bayat dilakukan melalui metode hidrotermal dengan teknik seeding. Sintesis dilakukan berdasarkan komposisi Al_2O_3 : 10 SiO_2 : 10,3 Na_2O : 180,3 H_2O rasio molar. Sebelum dilakukan sintesis, zeolit alam Bayat dipreparasi melalui proses purifikasi dan depolimerisasi. Hasil XRD menunjukkan bahwa zeolit yang dihasilkan merupakan zeolit NaY yang didominasi oleh kerangka sodalite. Hasil SEM-EDX memperlihatkan morfologi zeolit NaY seperti tumpang tindih dengan rasio Si/Al sebesar 2,30. Berdasarkan penelitian, zeolit NaY hasil sintesis memiliki sisi aktif yang besar sehingga dapat berperan menjadi adsorben ion logam kadmium II dan kobalt II. Hal ini dibuktikan dengan kapasitas adsorpsi ion kadmium II rata-rata zeolit NaY hasil sintesis lebih tinggi daripada kapasitas rata-rata adsorpsi dari zeolit alam Bayat raw pada waktu optimum 120 menit, 33,46 meq/100 g untuk zeolit alam Bayat raw dan 105,60 meq/100 g untuk zeolit NaY hasil sintesis. Kapasitas adsorpsi ion kobalt II rata-rata zeolit NaY hasil sintesis juga lebih tinggi daripada kapasitas rata-rata adsorpsi dari zeolit alam Bayat raw pada waktu optimum 120 menit, 12,88 meq/100 g untuk zeolit alam Bayat raw dan 78,25 meq/100 g untuk zeolit NaY hasil sintesis. Nilai kapasitas tukar kation zeolit alam Bayat raw adalah sebesar 24,41 meq/100 gram zeolit, sedangkan nilai kapasitas tukar kation zeolit NaY hasil sintesis adalah sebesar 43,45 meq/100 gram zeolit.

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NaY zeolite was hydrothermally synthesized using seeding technique. The synthesis were performed according to the following composition of Al_2O_3 10 SiO_2 10.3 Na_2O 180.3 H_2O molar ratio. XRD pattern confirmed that the structure was NaY zeolite. Before synthesis, natural zeolite Bayat were prepared through purification and depolymerization. From XRD measurement, it is observed that zeolite structures are dominated by sodalite framework. SEM EDX showed that NaY crystals were intergrowth with Si Al ratio of 2.30. In this study, NaY zeolite synthesized has more active sites to adsorb cadmium II and cobalt II ions because the average adsorption capacity cadmium II ions of as synthesized NaY zeolite is higher than the average adsorption capacity of raw Bayat natural zeolite at its optimum contact time 120 minutes, 33.46 meq 100 g for raw natural zeolite Bayat and 105.60 meq 100 g for as synthesized NaY zeolite. The average adsorption capacity cobalt II ions of as synthesized NaY zeolite is also higher than the average adsorption capacity of raw Bayat natural zeolite at its optimum contact time 120 minutes, 12.88 meq 100 g for raw natural zeolite Bayat and 78.25 meq 100 g for as synthesized NaY zeolite. The cation exchange capacity of raw Bayat natural zeolite is 24.41 meq 100 gram zeolite, besides the cation exchange capacity of as synthesized NaY zeolite is 43.45 meq 100 gram zeolite.