

**SINTESIS ZEOLIT-MAGNETIT TERMODIFIKASI
SETILTRIMETILAMMONIUM BROMIDA SEBAGAI
ADSORBEN ANION DIKROMAT**

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INTISARI

Modifikasi zeolit-magnetit dengan surfaktan kationik setiltrimetilamonium bromida (CTAB) sebagai adsorben anion dikromat telah dilakukan. Penelitian ini diawali dengan aktivasi zeolit alam (ZA) dengan larutan HCl 3M menghasilkan zeolit alam teraktivasi (ZAA). Modifikasi ZAA-magnetit disintesis melalui metode kopresipitasi dengan mencampurkan $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ dan $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, kemudian ditambahkan larutan NH_4OH hingga pH 11. ZAA-magnetit dimodifikasi dengan surfaktan setiltrimetilamonium bromida (CTAB) dengan konsentrasi 2 kapasitas tukar kation (KTK). Material hasil sintesis dikarakterisasi dengan FTIR, XRD, VSM, TEM, dan SEM. Adsorpsi anion dikromat dipelajari pengaruh pH, waktu kontak, dan konsentrasi adsorbat. Uji *recovery* dilakukan dengan medan magnet eksternal. Penentuan konsentrasi dikromat dianalisis menggunakan spektrofotometer UV-Vis pada λ 543 nm dengan larutan pengompleks 1,5-difenilkarbazid dan H_2SO_4 2M.

Hasil sintesis ZAA-magnetit melalui metode kopresipitasi dan modifikasi permukaan dengan surfaktan CTAB telah berhasil dilakukan yang menunjukkan karakteristik berupa serbuk berwarna coklat, memiliki rata-rata diameter ukuran partikel berkisar 36,95 nm, dan memiliki sifat kemagnetan. Uji adsorpsi anion dikromat diperoleh kondisi optimum pada pH 4 dan waktu kontak optimum 60 menit. Adsorpsi ion dikromat mengikuti model kinetika orde dua semu dengan konstanta laju adsorpsi $187,774 \text{ g mmol}^{-1} \text{ menit}^{-1}$ dan mengikuti model isoterm Langmuir dengan kapasitas adsorpsi $0,05 \text{ mmol g}^{-1}$ dan energi adsorpsi $25,623 \text{ kJ mol}^{-1}$.

Kata kunci: adsorpsi, CTAB, dikromat, magnetit, zeolit

***SYNTHESIS OF CETYLTRIMETHYLAMMONIUM BROMIDE
MODIFIED ZEOLITE-MAGNETITE AS ADSORBENT
OF DICHROMATE ANION***

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ABSTRACT

Zeolite-magnetite modification with cationic surfactant cetyltrimethylammonium bromide (CTAB) as dichromate anion adsorbent has been performed. This research begins with activating natural zeolite (ZA) with a 3 M HCl solution to produce activated natural zeolite (ZAA). Modified ZAA-magnetite was synthesized through the coprecipitation method with a mixture of $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ and $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ with added NH_4OH solution until pH 11. ZAA-Magnetic was modified with cationic surfactant cetyltrimethylammonium bromide (CTAB) with a concentration of 2 cation exchange capacity (CEC). The synthesized materials were characterized by FTIR, XRD, VSM, TEM, and SEM. The dichromate anion adsorption studied the effect of pH, contact time, and adsorbate concentration. The recovery test was carried out using an external magnetic field. The concentration of dichromate was analyzed by UV-Vis spectrophotometer at λ 543 nm with a complexing solution of 1,5-diphenylcarbazide and 2M H_2SO_4 .

The results of the synthesis of ZAA-magnetite through the coprecipitation method and surface modification with CTAB surfactant have been successfully carried out which shows the characteristics of a brown powder, average particle size diameter of 39.95 nm, and magnetic properties. The dichromate anion adsorption test was obtained optimum conditions at pH 4 and a contact time of 60 minutes. Dichromate ion adsorption followed the pseudo-second order kinetics model with an adsorption rate constant of $187.774 \text{ g mmol}^{-1} \text{ min}^{-1}$ and the Langmuir isotherm model with an adsorption capacity of 0.05 mmol g^{-1} and adsorption energy of $25.623 \text{ kJ mol}^{-1}$.

Keywords: adsorption, CTAB, dichromates, magnetite, zeolite