

KAJIAN ADSORPSI ION SULFAT PADA ZEOLIT-MAGNETIT TERMODIFIKASI SETILTRIMETILAMONIUM BROMIDA

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INTISARI

Telah dipelajari modifikasi zeolit alam dengan magnetit dan setiltrimetilamonium bromida (CTAB) sebagai adsorben ion sulfat. Penambahan magnetit dan CTAB pada zeolit alam aktivasi dilakukan untuk meningkatkan sifat adsorpsi dan daya *recovery* dari zeolit. Zeolit-magnetit termodifikasi CTAB diperoleh melalui aktivasi zeolit alam kemudian diberi penambahan magnetit secara kopresipitasi dan ditambahkan surfaktan CTAB dengan konsentrasi 2 Kapasitas Tukar Kation (KTK). Karakterisasi ZAA-Mag-CTAB dilakukan dengan spektrofotometer FTIR, difraktometer sinar-X, SEM-EDX, VSM, dan TEM. Kajian adsorpsi ion sulfat dipelajari pengaruh pH, pengaruh waktu kontak, variasi konsentrasi, variasi adsorben, model kinetika dan isoterm adsorpsinya. Konsentrasi ion sulfat diukur dengan spektrofotometer UV-Vis.

Hasil penelitian menunjukkan bahwa ZAA-Mag-CTAB dapat mengadsorpsi ion sulfat. Studi karakterisasi XRD, spektrofotometer FTIR, dan SEM-EDX yang telah dilakukan menunjukkan penambahan magnetit berhasil dilakukan dan sifat permukaan eksternal zeolit meningkat. Citra TEM menunjukkan distribusi ukuran partikel rata-rata pada ZAA-Mag-CTAB sebesar 125 nm. Kondisi optimum adsorpsi ion sulfat oleh ZAA-Mag-CTAB diperoleh pada pH 2 dan waktu kontak 60 menit. Studi kinetika menunjukkan proses adsorpsi mengikuti model kinetika orde dua-semu Ho-McKay dengan konstanta laju adsorpsinya $6,369 \text{ g mg}^{-1}\text{menit}^{-1}$. Studi isoterm menunjukkan proses adsorpsi mengikuti isoterm Langmuir dengan energi sebesar $22,946 \text{ kJ mol}^{-1}$.

Kata kunci: adsorpsi, CTAB, magnetit, sulfat, zeolit.

***STUDY OF SULFATE IONS ADSORPTION ON
CETYLTRIMETHYLAMMONIUM BROMIDE MODIFIED ZEOLITE-
MAGNETITE***

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ABSTRACT

Modification of natural zeolite with magnetite and cetyltrimethylammonium bromide (CTAB) for adsorption of sulfate ions has been studied. Magnetite and CTAB were added into activated natural zeolite to improve zeolite's properties and recovery power of zeolite. CTAB modified zeolite-magnetite was obtained by modifying activated zeolite using magnetite with coprecipitation method and CTAB surfactant with concentration as much as twice Cation Exchange Capacity (CEC). ZAA-Mag-CTAB was characterized by FTIR spectrophotometer, X-ray diffraction, SEM-EDX, VSM and, TEM. Adsorption of sulfate was studied on pH variation, contact time variation, concentration variation, adsorbent variation, adsorption kinetics and, its isotherm adsorption pattern. A UV-Vis spectrophotometer measured the concentration of sulfate ions.

The result showed that ZAA-Mag-CTAB could be used for sulfate ions adsorption. A study of XRD, FTIR spectrophotometer, and SEM-EDX showed that the addition of magnetite and CTAB has been successful and gave better properties of the external layer on zeolite. The TEM image showed the average particle distribution is 125 nm. A study obtained the optimum condition for sulfate ions adsorption by ZAA-Mag-CTAB at pH two and adsorption contact time at 60 minutes. An analysis of kinetics adsorption showed that adsorption followed the pseudo second-order (Ho-McKay) with the value of adsorption rate constant is $6.369 \text{ g mg}^{-1} \text{ min}^{-1}$. Study of isotherm adsorption showed that adsorption followed the Langmuir model with the value of isotherm energy is $22.946 \text{ kJ mol}^{-1}$.

Keywords: adsorption, CTAB, magnetite, sulfate, zeolite.