

## **KAJIAN ADSORPSI-DESORPSI ION SULFAT DAN MAGNESIUM PADA ZEOLIT TERMODIFIKASI CTAB**

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### **INTISARI**

Telah dipelajari modifikasi zeolit alam dengan setiltrimetilammonium bromida (CTAB) yang bertujuan sebagai adsorben ion sulfat dan magnesium. Ion sulfat dan magnesium yang telah teradsorpsi kemudian didesorpsi dalam media air dan asam sitrat untuk mengetahui potensinya sebagai pupuk lepas lambat. Zeolit-CTAB diperoleh melalui aktivasi zeolit alam yang dilanjutkan dengan modifikasi menggunakan CTAB dengan konsentrasi 2 kapasitas tukar kation. Karakterisasi Zeolit-CTAB dilakukan dengan difraktometer sinar-X, spektrofotometer FTIR dan spektrofotometer SEM-EDX. Adsorpsi ion sulfat dan magnesium dipelajari pengaruh variasi pH, variasi waktu kontak, variasi konsentrasi, variasi adsorben dan pola isoterm adsorpsinya. Desorpsi dilakukan dengan sistem statik dalam media air dan asam sitrat dengan variasi waktu desorpsi 0,25 hingga 24 jam. Konsentrasi ion sulfat dan magnesium diukur dengan spektrofotometer UV-Vis.

Hasil penelitian menunjukkan bahwa Zeolit-CTAB dapat digunakan untuk mengadsorpsi ion sulfat dan magnesium. Adsorpsi Zeolit-CTAB terhadap ion sulfat dan magnesium mengikuti model isoterm adsorpsi Langmuir. Kapasitas adsorpsi Zeolit-CTAB terhadap ion magnesium ( $2,86 \times 10^{-4} \text{ mol g}^{-1}$ ) lebih tinggi dibanding ion sulfat ( $3,01 \times 10^{-5} \text{ mol g}^{-1}$ ). Desorpsi ion sulfat dan magnesium mengikuti kinetika orde satu. Laju desorpsi ion sulfat dan magnesium dalam media asam sitrat lebih cepat dibanding dalam media air. Konstanta laju desorpsi ion sulfat dan magnesium dalam media asam sitrat sebesar  $45,1 \times 10^{-3}$  dan  $58,3 \times 10^{-3} \text{ jam}^{-1}$  sedangkan konstanta laju desorpsi ion sulfat dan magnesium dalam media air sebesar  $32,8 \times 10^{-3}$  dan  $40 \times 10^{-3} \text{ jam}^{-1}$ .

Kata kunci: adsorpsi, desorpsi, magnesium, sulfat, zeolit

## **STUDY OF SULFATE AND MAGNESIUM IONS ADSORPTION-DESORPTION ON CTAB MODIFIED ZEOLITE**

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### **ABSTRACT**

The modification of natural zeolite with cetyltrimethylammonium bromide for adsorption of sulfate and magnesium ions has been studied. In order to study its potential as slow release fertilizer, the adsorbed sulfate and magnesium ions were then desorbed in water and citric acid media. Zeolite-CTAB was obtained by modification of activated natural zeolite using CTAB with concentration as much as twice of cation exchange capacity. Zeolite-CTAB was characterized by X-ray diffractometer, FTIR spectrophotometer and SEM-EDX spectrophotometer. Adsorption of sulfate and magnesium ions was studied on pH variation, contact time variation, concentration variation, adsorbent variation, and its isotherm adsorption pattern. The desorption was carried out by batch system in water and citric acid media at various time from 0.25 to 24 hours. The concentration of sulfate and magnesium ions were measured by UV-Vis spectrophotometer.

The result showed that Zeolite-CTAB could be used for sulfate and magnesium ions adsorption. Adsorption of sulfate and magnesium ions on Zeolite-CTAB were corresponded to Langmuir adsorption isotherm. The adsorption capacity of magnesium ion ( $2.86 \times 10^{-4} \text{ mol g}^{-1}$ ) was higher than sulfate ion ( $3.01 \times 10^{-5} \text{ mol g}^{-1}$ ). The desorption of sulfate and magnesium ions were corresponded to first order kinetic. The desorption of both sulfate and magnesium ions in citric acid media was higher than those of in water media. The desorption rate of both sulfate and magnesium ion in citric acid media were  $4.25 \times 10^{-2}$  and  $5.51 \times 10^{-2} \text{ hour}^{-1}$ , respectively. The desorption rate of both sulfate and magnesium ions in water media were  $3.06 \times 10^{-2}$  and  $3.87 \times 10^{-2} \text{ hour}^{-1}$ , respectively.

Key words: adsorption, desorption, magnesium, sulfate, zeolite