

## **SINTESIS ZEOLIT ALAM/MAGNETIT TERMODIFIKASI CTAB DAN APLIKASINYA SEBAGAI ADSORBEN KATION AMONIUM DAN ANION FOSFAT PADA AIR TAMBAK UDANG**

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### **INTISARI**

Penelitian ini bertujuan untuk melakukan sintesis zeolit alam/magnetit termodifikasi CTAB dan aplikasinya sebagai adsorben kation amonium dan anion fosfat dalam air tambak udang. Penelitian ini diawali dengan preparasi zeolit alam kemudian dilakukan aktivasi zeolit dengan HCl 3 M menghasilkan zeolit alam teraktivasi (ZAA) kemudian dilakukan modifikasi dengan magnetit melalui metode kopresipitasi dengan  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ ,  $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ , dan agen pengendap NaOH 1 M menghasilkan ZAA/magnetit kemudian dimodifikasi kembali dengan CTAB menghasilkan CTAB-ZAA/magnetit. Karakterisasi dilakukan dengan FTIR, XRD, SEM-EDX, dan penentuan nilai Kapasitas Tukar Kation (KTK). Analisis konsentrasi pada studi adsorpsi kation amonium dan anion fosfat dalam air tambak udang dilakukan dengan spektrofotometer UV-Vis.

Karakterisasi material menunjukkan bahwa CTAB-ZAA/magnetit berhasil disintesis. Kondisi optimum adsorpsi kation amonium adalah pada pH 7 dan waktu kontak 75 menit sedangkan kondisi optimum adsorpsi anion fosfat adalah pada pH 4 dan waktu kontak 60 menit. Adsorpsi kation amonium dan anion fosfat mengikuti model kinetika orde dua semu Ho dan McKay dan isotherm adsorpsi Langmuir. Kapasitas adsorpsi CTAB-ZAA/magnetit terhadap kation amonium dan anion fosfat berturut-turut adalah  $2,0 \times 10^{-6} \text{ mol g}^{-1}$  dan  $1,99 \times 10^{-5} \text{ mol g}^{-1}$ . Urutan kemampuan adsorpsi pada larutan standar dan aplikasinya pada air tambak udang berdasarkan variasi adsorben dalam mengadsorp kation amonium adalah  $\text{CTAB-ZAA/magnetit} < \text{ZAA/magnetit} < \text{ZAA} < \text{ZA}$  sedangkan urutan dalam mengadsorp anion fosfat adalah  $\text{CTAB-ZAA/magnetit} > \text{ZAA/magnetit} > \text{ZAA} > \text{ZA}$ .

Kata kunci: adsorpsi, amonium, fosfat, magnetit, zeolit.

## **SYNTHESIS OF CTAB-MODIFIED NATURAL ZEOLITE/MAGNETITE AND ITS APPLICATION AS ADSORBENT OF AMMONIUM CATION AND PHOSPHATE ANION IN SHRIMP POND WATER**

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### **ABSTRACT**

This study aims to synthesize CTAB-modified natural zeolite/magnetite and its application as an adsorbent of ammonium cation adsorbents and phosphate anions in shrimp pond water. This research began with preparing natural zeolite and then activated zeolite with HCl 3 M to produce activated natural zeolite (ZAA). The activated natural zeolite (ZAA) was then modified with magnetite through the coprecipitation method with the reagents  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ ,  $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ , and the 1 M NaOH settling agent to form ZAA/magnetite then modified again with CTAB to produce ZAA/magnetite-CTAB. Characterization was performed using FTIR, XRD, and SEM-EDX, as well as determining Cation Exchange Capacity (CEC) values. The concentration in adsorption studies of ammonium cations and phosphate anions in shrimp pond water was conducted using a UV-Vis spectrophotometer.

The material characterization results show that CTAB-ZAA/magnetite has been successfully synthesized. The optimum condition of ammonium cation adsorption was at pH 7 and a contact time of 75 min. In comparison, the optimum conditions of adsorption of phosphate anions were at pH 4 and a contact time of 60 min with Ho and McKay kinetic models and Langmuir adsorption isotherms. The adsorption capacity of CTAB-ZAA/magnetite to ammonium cation and phosphate anion was  $2.0 \times 10^{-6} \text{ mol g}^{-1}$  and  $1.99 \times 10^{-5} \text{ mol g}^{-1}$ , respectively. The order of adsorption ability in standard solutions and their application to Kulon Progo pond water based on adsorbent variations in adsorbents in adsorb ammonium cations is ZAA-magnetite-CTAB < ZAA/magnetite < ZAA < ZA while the sequence in adsorbing phosphate anions is ZAA-magnetite-CTAB > ZAA/magnetite > ZAA > ZA.

**Keywords:** adsorption, ammonium, magnetite, phosphate, zeolite.