

**SINTESIS NANOKRISTAL MAGNETIT TERMODIFIKASI
CETYLTRIMETHYLAMMONIUM BROMIDE UNTUK ADSORPSI
REMAZOL YELLOW**

Melio Venagy A.R.A

18/427635/PA/18595

INTISARI

Penelitian mengenai sintesis nanokristal magnetit (Fe_3O_4) termodifikasi CTAB (*cetyltrimethylammonium bromide*) untuk adsorpsi zat warna *remazol yellow* telah dilakukan. Sintesis nanokristal Fe_3O_4 dan Fe_3O_4 -CTAB pada pH 9-11 menggunakan $\text{Fe}^{3+}/\text{Fe}^{2+}$ dengan perbandingan molar 2:1 sebagai bahan utama dengan NH_4OH sebagai agen pengendap dan penambahan NH_4Cl pada sintesis Fe_3O_4 -CTAB dengan variasi konsentrasi CTAB pada pelapisan Fe_3O_4 yaitu 0,01; 0,05; 0,1; 0,25; dan 0,5 M. Nanokristal Fe_3O_4 dan Fe_3O_4 -CTAB dikarakterisasi menggunakan FTIR, XRD, SEM-EDX, dan VSM. Kajian adsorpsi zat warna *remazol yellow* dipelajari pengaruh variasi konsentrasi adsorben, pH, kinetika, dan isoterm adsorpsi.

Hasil penelitian menunjukkan bahwa nanokristal Fe_3O_4 dan Fe_3O_4 terlapis CTAB telah berhasil disintesis melalui metode kopresipitasi dengan wujud padatan serbuk, berwarna hitam, serta dapat dipisahkan dengan medan magnet eksternal. Uji pendahuluan dengan Fe_3O_4 – CTAB₄ (CTAB 0,25 M) memiliki kemampuan adsorpsi optimum terhadap *remazol yellow* yaitu sebesar 55,58%. Kondisi optimum adsorpsi *remazol yellow* oleh nanokristal Fe_3O_4 – CTAB₄ didapatkan pada pH 5, berat adsorben 10 mg, volume larutan 10 mL, dan waktu kontak selama 30 menit. Model kinetika adsorpsi mengikuti orde-dua semu dengan konstanta laju adsorpsi $8,70 \times 10^4 \text{ g mol}^{-1} \text{ menit}^{-1}$. Proses adsorpsi mengikuti isoterm Langmuir dengan kapasitas adsorpsi maksimum sebesar $2,95 \times 10^{-5} \text{ mol g}^{-1}$ yang menunjukkan adsorpsi terjadi pada permukaan tunggal yang homogen.

Kata kunci: adsorpsi, CTAB, magnetit, *remazol yellow*

***SYNTHESIS OF CETYLTRIMETHYLAMMONIUM BROMIDE MODIFIED
MAGNETITE NANOCRYSTALS FOR REMAZOL YELLOW ADSORPTION***

Melio Venagy A.R.A

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ABSTRACT

A study of synthesis of CTAB (cetyltrimethylammonium bromide) modified magnetite (Fe_3O_4) nanocrystals for remazol yellow dye adsorption has been conducted. Magnetite and CTAB-coated magnetite were synthesized at pH 9-11 using $\text{Fe}^{3+}/\text{Fe}^{2+}$ with molar ratio of 2:1 as a precursor, NH_4OH as precipitating agent and the addition of NH_4Cl for the synthesis of Fe_3O_4 -CTAB. CTAB coating on magnetite varied in concentration 0.01, 0.05, 0.1, 0.25, and 0.5 M. The nanocrystals were characterized using FTIR, XRD, SEM-EDX, and VSM. The adsorption study of remazol yellow was studied by variation of adsorbent, pH, kinetics, and adsorption isotherms.

The results showed that modification of magnetite and CTAB had been successfully done through the coprecipitation method in the form of solid and black that can be separated by an external magnetic field. The preliminary adsorption test shows that Fe_3O_4 -CTAB₄ (CTAB 0.25 M) has the optimum adsorption ability for remazol yellow that equal to 55.58%. The optimum condition for remazol yellow adsorption by Fe_3O_4 -CTAB₄ was obtained using 10 mg adsorbent, 10 mL of solution at pH 5, and an adsorption contact time of 30 minutes. The study of adsorption kinetics showed that the rate constant is $8.70 \times 10^4 \text{ g mol}^{-1} \text{ minutes}^{-1}$. The adsorption process followed the Langmuir isotherm in which the adsorption occurs on a single homogeneous surface with a maximum adsorption capacity of $2.95 \times 10^{-5} \text{ mol g}^{-1}$.

Keywords: adsorption, CTAB, magnetite, remazol yellow