

SINTESIS MAGNETIT (Fe₃O₄) TERMODIFIKASI CETYLTRIMETHYLAMMONIUM BROMIDE (CTAB) UNTUK ADSORPSI ZAT WARNA *INDIGO CARMINE*

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INTISARI

Sintesis magnetit (Fe₃O₄) dan modifikasi magnetit dengan surfaktan *cetyltrimethylammonium bromide* (CTAB) telah dilakukan. Penelitian ini bertujuan untuk mengkaji pengaruh konsentrasi CTAB pada modifikasi magnetit dan aplikasinya sebagai adsorben zat warna *indigo carmine*. Magnetit disintesis dengan metode kopresipitasi terhadap larutan Fe³⁺ dan Fe²⁺ menggunakan NH₄OH sebagai agen pengendap. Modifikasi magnetit dilakukan dengan variasi konsentrasi CTAB 0,01; 0,05; 0,10; 0,25; dan 0,50 M. Material hasil sintesis dikarakterisasi dengan FTIR, XRD, SEM-EDX, dan VSM, sedangkan jumlah zat warna *indigo carmine* yang teradsorpsi dianalisis dengan metode kolorimetri menggunakan spektrofotometri UV-Vis. Hasil penelitian menunjukkan modifikasi magnetit dengan CTAB berhasil dilakukan melalui interaksi elektrostatik. Uji pendahuluan adsorpsi menunjukkan bahwa *indigo carmine* teradsorpsi optimum oleh Fe₃O₄-CTAB dengan konsentrasi 0,10 M. Adsorpsi optimum *indigo carmine* oleh Fe₃O₄-CTAB tercapai pada pH 1, mengikuti model kinetika adsorpsi orde kedua semu Ho dan McKay dengan konstanta laju adsorpsi sebesar 3,25×10⁴ g mol⁻¹ menit⁻¹, mengikuti model isoterm Langmuir dengan kapasitas adsorpsi 35,93 mg g⁻¹ dan berlangsung secara spontan, eksotermis dan lebih menguntungkan pada temperatur rendah.

Kata kunci: magnetit, CTAB, *indigo carmine*

***SYNTHESIS OF MAGNETITE (Fe₃O₄) MODIFIED BY
CETYLTRIMETHYLAMMONIUM BROMIDE (CTAB) FOR
ADSORPTION OF INDIGO CARMINE DYE***

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ABSTRACT

Synthesis of magnetite (Fe₃O₄) and modification of magnetite with cetyltrimethylammonium bromide (CTAB) surfactant have been carried out. This study aims to examine the effect of CTAB concentration on magnetite modification and its application as an adsorbent for indigo carmine dye. Magnetite was synthesized by coprecipitation method against Fe³⁺ and Fe²⁺ solutions using NH₄OH as a precipitating agent. Magnetite modification was carried out by varying the concentration of CTAB 0.01, 0.05, 0.10, 0.25, and 0.50 M. The results of the synthesis of materials were characterized by FTIR, XRD, SEM-EDX, and VSM, while the amount of adsorbed indigo carmine dye was analyzed using colorimetry method with UV-Vis spectrophotometry. The results showed that magnetite modification with CTAB was successfully carried out through electrostatic interactions. Preliminary adsorption test showed that indigo carmine was optimally adsorbed by Fe₃O₄-CTAB with a concentration of 0.10 M. The optimum adsorption of indigo carmine by Fe₃O₄-CTAB was achieved at pH 1, following a Ho and McKay pseudo second-order adsorption kinetics model with an adsorption rate constant of 3.25×10⁴ g mol⁻¹ min⁻¹, following the Langmuir isotherm model with an adsorption capacity of 35.93 mg g⁻¹ and that takes place spontaneously, exothermically and is more favourable at low temperatures.

Keywords: magnetite, CTAB, indigo carmine