

MODIFIKASI MAGNETIT MENGGUNAKAN ASAM OLEAT DAN APLIKASINYA SEBAGAI ADSORBEN METILEN BIRU

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INTISARI

Telah dilakukan modifikasi magnetit menggunakan asam oleat. Penelitian ini bertujuan untuk mengkaji pengaruh volume asam oleat pada modifikasi magnetit dan aplikasinya sebagai adsorben metilen biru dan metil orange. Magnetit dan magnetit termodifikasi asam oleat (MTAO) disintesis menggunakan NH_4OH sebagai agen pengendap dan variasi asam oleat 3, 6, 9, 12, dan 15 mL. Material hasil sintesis dikarakterisasi dengan FTIR, XRD, VSM, dan SEM-EDX. Uji pendahuluan adsorpsi metilen biru dan metil orange dilakukan untuk mengetahui kemampuan adsorben dalam mengadsorpsi zat warna. Adsorpsi zat warna optimum dipelajari pengaruh pH, kinetika adsorpsi-desorpsi, dan isoterm adsorpsi.

Hasil penelitian menunjukkan bahwa volume asam oleat berpengaruh pada sintesis magnetit. Uji pendahuluan adsorpsi menunjukkan bahwa metil orange jauh lebih sedikit teradsorpsi dibandingkan metilen biru. Adsorpsi optimum metil orange pada magnetit sebesar 9,673% sedangkan metilen biru pada magnetit termodifikasi asam oleat 15 mL (MTAO(15)) sebesar 86,785%. Adsorpsi metilen biru oleh MTAO(15) optimum tercapai pada pH 8, mengikuti model kinetika pseudo orde kedua (H_0) dengan konstanta laju adsorpsi $3,694 \times 10^4 \text{ g.mol}^{-1}.\text{menit}^{-1}$, dan mengikuti model isoterm Langmuir dengan kapasitas adsorpsi dan energi adsorpsi $1,337 \times 10^{-4} \text{ mol/g}$ dan 26,428 kJ/mol. Kajian desorpsi metilen biru dari MTAO(15) pada larutan NaCl mengikuti model kinetika pseudo orde kedua (H_0) dengan konstanta laju desorpsi $4,077 \times 10^3 \text{ g.mol}^{-1}.\text{menit}^{-1}$ untuk larutan NaCl 0,1 M dan $5,805 \times 10^3 \text{ g.mol}^{-1}.\text{menit}^{-1}$ untuk larutan NaCl 1 M.

Kata kunci: magnetit, asam oleat, adsorpsi, desorpsi, metilen biru

MODIFICATION OF MAGNETITE USING OLEIC ACID AND ITS APPLICATION AS ADSORBENT OF METHYLENE BLUE

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ABSTRACT

Modification of magnetite using oleic acid has been done. This research aims to study the effect of oleic acid volume added on synthesis of magnetite and its application as adsorbent of methylene blue and methyl orange. Magnetite and magnetite modified by oleic acid (MTAO) was synthesized with NH_4OH as precipitating agent and oleic acid variation 3, 6, 9, 12, and 15 mL. Characterization of synthesized materials was carried out using FTIR, XRD, VSM, and SEM-EDX. The preliminary methylene blue and methyl orange adsorption test was conducted to find out the appropriate adsorbent for dye. The optimum dye adsorption studied by the effect of pH, adsorption-desorption kinetics, and adsorption isotherm.

The result showed that oleic acid volume had an effect on magnetite synthesis. The preliminary adsorption test showed that methyl orange was less adsorbed than methylene blue. Optimum adsorption of methyl orange by magnetite was 9.673% and methylene blue by magnetite modified with 15 mL of oleic acid (MTAO(15)) was 86.785%. The adsorption of methylene blue by MTAO(15) was optimum at pH 8, followed the pseudo-second order kinetic model (Ho) with adsorption rate constant $3.694 \times 10^4 \text{ g} \cdot \text{mol}^{-1} \cdot \text{minute}^{-1}$ and followed Langmuir isotherm model with adsorption capacity and adsorption energy $1.337 \times 10^{-4} \text{ mol/g}$ and 26.428 kJ/mol. The study of methylene blue desorption from MTAO(15) at NaCl solution followed the pseudo-second order kinetic model (Ho) with desorption rate constant $4.077 \times 10^3 \text{ g} \cdot \text{mol}^{-1} \cdot \text{minute}^{-1}$ for 0.1 M NaCl solution and $5.805 \times 10^3 \text{ g} \cdot \text{mol}^{-1} \cdot \text{minute}^{-1}$ for 1 M NaCl solution.

Keywords: magnetite, oleic acid, adsorption, desorption, methylene blue