

SINTESIS KOMPOSIT ASAM HUMAT-KITOSAN TERMODIFIKASI MAGNETIT SEBAGAI ADSORBEN METILEN BIRU

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INTISARI

Penelitian mengenai sintesis komposit asam humat-kitosan termodifikasi magnetit untuk menghasilkan adsorben metilen biru telah dilakukan. Penelitian ini bertujuan untuk mengetahui karakteristik komposit asam humat-kitosan termodifikasi magnetit, mempelajari pengaruh pH terhadap adsorpsi metilen biru, dan mempelajari kinerja komposit dalam mengadsorpsi metilen biru melalui kajian kinetika adsorpsi dan isoterm adsorpsi.

Sintesis komposit asam humat-kitosan termodifikasi magnetit meliputi ekstraksi asam humat, preparasi matriks asam humat terimobilisasi pada kitosan, dan diikuti penggabungan magnetit secara kopresipitasi. Keberhasilan sintesis adsorben hibrida dikonfirmasi menggunakan karakterisasi FTIR, XRD, dan VSM. Penentuan pH PZC, pH optimum, kinetika, dan isoterm adsorpsi adsorben dilakukan untuk memahami perilaku adsorben dalam berbagai pH dan interaksinya terhadap metilen biru.

Analisis FTIR menunjukkan bahwa komposit asam humat-kitosan termodifikasi magnetit telah berhasil disintesis. Adsorben memiliki struktur amorf ditandai pola difraksi yang luas dan tidak teratur. Selanjutnya, analisis VSM mengkonfirmasi bahwa adsorben bersifat paramagnetik dengan kurva magnetisasi yang linier dan positif terhadap medan magnetik. Adsorben memiliki permukaan negatif pada $\text{pH} > 5,5$, sehingga adsorben dapat berikatan dengan metilen biru pada rentang pH yang lebih luas. Kinetika adsorpsi ini mengikuti model kinetika order dua semu, sedangkan isoterm adsorpsi mengikuti model isoterm Langmuir. Kapasitas adsorpsi adsorben pada metilen biru sebesar 40,65 mg/g pada pH 11. Berdasarkan hasil karakterisasi dan kinerja adsorben dalam interaksi dengan metilen biru komposit asam humat-kitosan termodifikasi magnetit dapat digunakan dalam aplikasi penyerapan metilen biru.

Kata kunci: adsorben, asam humat, kitosan, magnetit, metilen biru

SYNTHESIS OF MAGNETITE MODIFIED HUMIC ACID-CHITOSAN COMPOSITE AS METHYLENE BLUE ADSORBENT

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ABSTRACT

Research on the synthesis of magnetite modified humic acid-chitosan composite to produce methylene blue adsorbent has been conducted. This study was aimed to determine the characteristics of magnetite-modified humic acid-chitosan composites, study the effect of pH on methylene blue adsorption, and study the performance of the composites in adsorbing methylene blue through studies of adsorption kinetics and isotherm adsorption.

The synthesis of the magnetite modified humic acid-chitosan composite involved the extraction of humic acid from peat soil, preparation of humic acid matrix immobilized on chitosan, and followed by the incorporation of magnetite by coprecipitation. The successful synthesis of the adsorbent was confirmed using FTIR, XRD, and VSM characterization. Determination of pH PZC, optimum pH, adsorption kinetics, and adsorption isotherms of the adsorbent were carried out to understand the behaviour of the adsorbent under various pH and its interaction with methylene blue.

Magnetite modified humic acid-chitosan composite was successfully synthesized based on FTIR analysis. The adsorbent has an amorphous structure characterized by broad and irregular diffraction patterns. Furthermore, VSM analysis confirmed that the adsorbent is paramagnetic indicated by the magnetization curve which is linear and positive to the magnetic field. At pH > 5.5, the adsorbent was negatively charged, allowing the binding to methylene blue over a broader pH range. The adsorption kinetics of this adsorbent followed by second-order pseudo model, while the adsorption isotherm followed the Langmuir isotherm model. The adsorption capacity of the adsorbent on methylene blue was 40.65 mg/g at pH 11. Based on the characterization results and the performance of the adsorbent in interaction with methylene blue, the magnetite modified humic acid-chitosan composite can be used in methylene blue sorption applications.

Keywords: adsorbent, humic acid, chitosan, magnetite, methylene blue