

SINTESIS KOMPOSIT KITOSAN/MAGNETIT/OLEAT SEBAGAI ADSORBEN BIRU METILEN

NICOLAS KEVIN KRISTIAN TO
16/398592/PA/17553

INTISARI

Dalam penelitian ini telah disintesis komposit kitosan/magnetit/oleat sebagai adsorben biru metilen. Penelitian ini bertujuan untuk mengkaji kemampuan komposit kitosan/magnetit/oleat (KMO) dalam penghilangan zat warna kationik biru metilen pada limbah cair dengan menentukan pH optimum adsorpsi serta mengkaji kinetika dan kapasitas adsorpsi zat warna biru metilen oleh adsorben. Komposit disintesis dengan mencampur kitosan *high grade* dan nanopartikel magnetit/oleat (MO), kemudian disonikasi selama 10 menit, diaduk selama 20 menit, dan ditambahkan 2 mL glutaraldehid 25%, serta dibiarkan terjadi kait-silang selama 3 jam. Nanopartikel MO disintesis dengan metode kopresipitasi, yaitu menambahkan larutan NH_4OH hingga pH 9-11 pada campuran Fe^{2+} dan Fe^{3+} 1:2, kemudian ditambahkan 3 mL asam oleat. Nanopartikel MO dan komposit KMO dipisahkan secara magnetik lalu dicuci menggunakan akuabides dan etanol.

Hasil penelitian ini menunjukkan bahwa komposit KMO telah berhasil disintesis dan dibuktikan dengan hasil analisis FTIR, XRD, VSM, dan TEM. Dari persamaan Debye-Scherrer, ukuran partikel magnetit dalam komposit sebesar 16,396 nm lebih kecil dibandingkan ukuran partikel magnetit dalam nanopartikel sebesar 20,482 nm. Berdasarkan karakterisasi TEM hal tersebut dipengaruhi oleh kemampuan kitosan dan oleat dalam mencegah terjadinya aglomerasi. Hasil kajian adsorpsi zat warna kationik biru metilen oleh komposit KMO menunjukkan adsorpsi maksimal terjadi pada pH 11 dan mengikuti kinetika orde dua semu dengan harga k_2 sebesar $0,059 \text{ g.mol}^{-1}.\text{menit}^{-1}$. Isoterm adsorpsi mengikuti model isoterm Freundlich dengan nilai K_F sebesar $1,858 \text{ L.g}^{-1}$.

Kata kunci: adsorben, kationik, kinetika, kitosan/magnetit/oleat

***SYNTHESIS OF CHITOSAN/MAGNETITE/OLEIC COMPOSITE AS
ADSORBENT OF METHYLENE BLUE***

NICOLAS KEVIN KRISTIAN TO
16/398592/PA/17553

ABSTRACT

In this research, chitosan/magnetite/oleic composite has been synthesized as methylene blue adsorbents. This research purposes are to study the ability of chitosan/magnetite/oleic composite in the removal of methylene blue cationic dye in wastewater by determining the optimum pH of adsorption and to study the kinetics and adsorption capacity of methylene blue cationic dye by the adsorbent. The composite was synthesized by mixing high grade chitosan with magnetite/oleic (MO) nanoparticles, then sonicated for 10 minutes, stirred for 20 minutes, and added 2 mL of 25% glutaraldehyde, and allowed to cross-link for 3 hours. MO nanoparticles were synthesized by coprecipitation method, which was adding a solution of NH_4OH up to pH 9-11 to a mixture of Fe^{2+} and Fe^{3+} 1:2, then 3 mL of oleic acid was added. The MO nanoparticles and KMO composite were separated magnetically and then washed with double distilled water and ethanol.

The result of this research indicated that the KMO composite has been successfully synthesized and confirmed by FTIR, XRD, VSM, and TEM analysis. From Debye-Scherrer equation, the magnetite particle size in the composite is 16.396 nm smaller than the magnetite particle size in the nanoparticles is 20.482 nm. Based on the TEM characterization, it is influenced by the ability of chitosan and oleic to prevent agglomeration. The result of the study on the cationic methylene blue dye by KMO composite showed that the maximum adsorption occurred at pH 11 and followed pseudo-second order kinetics with the value of k_2 of $0.0059 \text{ g.mol}^{-1} \cdot \text{minute}^{-1}$. The adsorption isotherm followed the Freundlich isotherm model with the value of K_F of 1.858 L.g^{-1} .

Keywords: adsorbent, cationic, chitosan/magnetite/oleic, kinetics