

ADSORPSI-DESORPSI ZAT WARNA METILEN BIRU DENGAN SELULOSA SERBUK KULIT NANAS TERMODIFIKASI ASAM TRIMELLITAT

Annisa Fitri Nurlaila
18/427607/PA/18567

INTISARI

Adsorpsi-desorpsi zat warna metilen biru (MB) dengan selulosa serbuk kulit nanas termodifikasi asam trimellitat (SAT) telah dipelajari. Penelitian ini bertujuan untuk melakukan modifikasi dan karakterisasi adsorben berbasis SAT, menentukan kondisi optimum adsorpsi zat warna metilen biru berdasarkan pengaruh pH, massa adsorben, waktu kontak dan konsentrasi awal zat warna, mempelajari kinetika dan isoterm adsorpsi zat warna metilen biru menggunakan SAT, dan mempelajari reaksi desorpsi adsorben berbasis SAT. Adsorben SAT disintesis dari selulosa (SA) dengan trimellitat anhidrat (TMA) dalam pelarut dimetilacetamida (DMA). SA dan SAT yang diperoleh dikarakterisasi dengan spektrofotometer FTIR, XRD dan SEM. Kajian adsorpsi dilakukan dengan variasi pH larutan, massa adsorben, waktu kontak, dan konsentrasi awal metilen biru, sedangkan kajian desorpsi yang dilakukan dengan variasi pelarut desorpsi dan waktu desorpsi. Konsentrasi metilen biru setelah adsorpsi dan desorpsi ditentukan dengan spektrofotometri UV-Vis pada panjang gelombang 665 nm.

Berdasarkan penelitian, hasil karakterisasi FTIR, XRD, dan SEM yang diperoleh menunjukkan terjadinya proses pencangkakan trimellitat anhidrat ke dalam adsorben selulosa. Pada proses adsorpsi keadaan optimum terjadi pada pH 6, massa adsorben 0,100 g, waktu kontak 90 menit dan konsentrasi zat warna optimum pada 200 mg L⁻¹. Proses adsorpsi berlangsung mengikuti reaksi orde dua semu dengan konstanta laju reaksi 1,87×10⁻³ g mg⁻¹ menit⁻¹ dan sesuai dengan isoterm Langmuir dengan kapasitas adsorpsi maksimum 37,4 mg g⁻¹. Desorpsi metilen biru mencapai kondisi optimum jika digunakan pelarut NaCl 1,0 M dan waktu kontak desorpsi 60 menit. Interaksi antara MB dan selulosa didominasi oleh interaksi elektrostatik, ikatan hidrogen, dan interaksi π - π .

Kata kunci: adsorpsi, desorpsi, kulit nanas, metilen biru, selulosa

***ADSORPTION-DESORPTION OF METHYLENE BLUE DYES ON
TRIMELLITIC ACID MODIFIED CELLULOSE PINEAPPLE PEEL
POWDER***

Annisa Fitri Nurlaila
18/427607/PA/18567

ABSTRACT

The adsorption-desorption of methylene blue (MB) dye with trimellitic acid modified cellulose pineapple peel powder (CTA) has been conducted. This research aimed to modify and characterize the CTA adsorbent, determine the optimum conditions for adsorption of MB, determine the kinetics and isotherm adsorption of MB, and determine the desorption reaction of MB using CTA. The CTA adsorbent was synthesized from cellulose (CA) with trimellitic anhydride in DMA solvent (CTA). Then, CA and CTA were characterized by using FTIR spectrophotometers, XRD, and SEM. The adsorption process was carried out by varying the pH of the solution, adsorbent mass, contact time, and initial concentration of methylene blue. The desorption process was carried out by varying the desorption solvent and desorption time. The concentration of MB after adsorption and desorption was determined using UV-visible spectrophotometer at wavelength 665 nm.

Based on research, the characterization result of FTIR, XRD, and SEM shows that the grafting process of trimellitic acid anhydrous on the cellulose adsorbent has been successfully accomplished. In the adsorption process, optimum conditions are achieved at the pH level of 6, with the adsorbent dose of 0,100 g, 90 minutes of contact time and initial concentration of dye at 200 mg L⁻¹. The adsorption process follows the pseudo 2nd order reactions with a rate constant of 1.87×10⁻³ g mg⁻¹ minutes⁻¹ and the isotherm follows the Langmuir isotherm model with a maximum adsorption capacity of 37.4 mg g⁻¹. The desorption of the methylene blue dye from the adsorbent reaches its optimum condition using the NaCl 1.0 M and desorption contact time at 60 minutes. The interaction between MB and cellulose is dominated by electrostatic interaction, hydrogen bonds, and π - π interaction.

Keywords: adsorption, cellulose, desorption, methylene blue, pineapple peel

