

## SELULOSA KULIT SAGU TERMODIFIKASI EDTA SEBAGAI ADSORBEN ZAT WARNA KATIONIK *BASIC VIOLET 10* DAN ANIONIK *REACTIVE ORANGE 16*

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### INTISARI

Telah dilakukan penelitian tentang selulosa kulit sagu termodifikasi EDTA sebagai adsorben zat warna kationik *Basic Violet 10* dan anionik *Reactive Orange 16*. Penelitian bertujuan untuk melakukan modifikasi dan karakterisasi adsorben berbasis selulosa, menentukan kondisi optimum adsorpsi berdasarkan pengaruh pH, konsentrasi awal zat warna, dan waktu kontak, mempelajari kinetika, isoterm, dan termodinamika adsorpsi, mengetahui efektivitas pelarut NaOH sebagai agen pendesorpsi, dan melakukan uji aplikasi adsorben selulosa termodifikasi EDTA pada limbah mengandung zat warna kationik BV10 dan anionik RO16. Selulosa disintesis dari kulit sagu dan dimodifikasi melalui perendaman dalam larutan EDTA. Kajian adsorpsi dilakukan dengan menentukan kondisi optimum adsorpsi berdasarkan pH, konsentrasi awal zat warna, dan waktu kontak. Kondisi optimum adsorpsi diaplikasikan pada adsorpsi limbah mengandung zat warna. Kajian desorpsi dilakukan dengan pelarut NaOH melalui siklus adsorpsi-desorpsi sebanyak tiga kali. Karakterisasi dilakukan dalam penelitian pada adsorben sebelum dan setelah dimodifikasi EDTA, serta setelah mengadsorpsi zat warna menggunakan alat FTIR, SEM, dan BET.

Hasil karakterisasi menunjukkan terbentuknya ikatan ester, keberadaan gugus fungsi amina, serta peningkatan luas permukaan dan jumlah pori adsorben setelah dimodifikasi dengan EDTA. Penggunaan adsorben Sel-EDTA memberikan kondisi optimum adsorpsi zat warna BV10 pada pH 4, konsentrasi awal 700 ppm, dan waktu kontak 120 menit; dan zat warna RO16 pada pH 3, konsentrasi awal 400 ppm, dan waktu kontak 90 menit. Proses adsorpsi dengan adsorben Sel-EDTA tetap mengikuti model isoterm Langmuir dan kinetika orde dua. Kajian termodinamika adsorpsi dengan Sel-EDTA dapat berlangsung, terjadi secara spontan, berjalan secara endoterm, dan merupakan proses adsorpsi kimia. Kajian desorpsi membuktikan bahwa pelarut NaOH efektif mendesorpsi zat warna BV10 dan RO16 masing-masing mencapai 92,14 dan 99,94%. Berdasarkan penelitian, diketahui bahwa adsorben yang telah dimodifikasi dengan EDTA (Sel-EDTA) lebih optimal dalam mengadsorpsi zat warna kationik dibandingkan zat warna anionik.

**Kata kunci:** adsorben berbasis selulosa, adsorpsi, EDTA, kulit sagu, zat warna

## EDTA-MODIFIED SAGO BARK CELLULOSE AS ADSORBENT OF CATIONIC BASIC VIOLET 10 AND ANIONIC REACTIVE ORANGE 16 DYES

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### ABSTRACT

EDTA-modified sago bark cellulose as adsorbent of cationic Basic Violet 10 and anionic Reactive Orange 16 dyes has been carried out. This research aimed to modify and characterize cellulose-based adsorbent, determine the optimum adsorption conditions based on the effect of pH, initial dye concentration, and contact time, study the adsorption kinetics, isotherms, and thermodynamics, determine the effectiveness of NaOH as a desorption agent, and apply the EDTA-modified cellulose adsorbents at optimum conditions for the adsorption of waste containing both cationic BV10 and anionic RO16 dyes. Cellulose was synthesized from sago bark and modified by soaking in EDTA solution. Adsorption studies were carried out by determining the optimum adsorption conditions based on pH, initial dye concentration, and contact time. Optimum adsorption conditions were applied to the adsorption of dyestuff-containing waste. Desorption studies were carried out with NaOH solvent through adsorption-desorption cycles three times. Characterization in this research was carried out on adsorbents before and after EDTA modification, also after the adsorption of dyes using FTIR, SEM, and BET instruments.

The characterization results showed the formation of ester bonds, the presence of amine functional groups, and an increase in the surface area and number of pores of the adsorbent after being modified with EDTA. The use of Cell-EDTA adsorbent provided optimum conditions for adsorption of BV10 dye at pH 4, initial concentration of 700 ppm, and contact time of 120 minutes; and RO16 dye at pH 3, initial concentration of 400 ppm, and contact time of 90 minutes. The adsorption process with Cell-EDTA adsorbent still followed the Langmuir isotherm and pseudo-second-order kinetics model. Thermodynamic studies of Cell-EDTA adsorption were feasible, spontaneous, endothermic, and typical of chemisorption. Desorption studies proved that NaOH was effective for desorption of BV10 and RO16 up to 92.14 and 99.94%, respectively. Based on research, EDTA-modified adsorbent (Cell-EDTA) was more favorable in cationic dye adsorption than anionic dye.

**Keywords:** adsorption, cellulose-based adsorbent, dyes, EDTA, sago bark