

ABSTRAK

KAJIAN ADSORPSI ZAT WARNA CONGO RED DAN METIL ORANYE OLEH BIOMASSA *Nannochloropsis* sp. TERMODIFIKASI SURFAKTAN KATIONIK

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Pada penelitian ini telah dilakukan adsorpsi zat warna *congo red* (CR) dan metil oranye (MO) oleh adsorben alga *Nannochloropsis* sp. yang telah dimodifikasi dengan CaCl_2 dan surfaktan kationik HDTMA-Br. Adsorben hasil modifikasi dikarakterisasi menggunakan spektrometer *Fourier Transform Infrared* (FTIR) untuk mengidentifikasi gugus fungsi dan *Scanning Electron Microscopy with Energi Dispersive X-Ray* (SEM-EDX) untuk menganalisis morfologi permukaan dan komposisi unsur dalam adsorben. Kadar zat warna CR dan MO dianalisis dengan menggunakan spektrofotometer UV-Vis. Adsorpsi zat warna CR dan MO optimum terjadi pada dosis Alga-N, Alga-N-Ca dan Alga-N-HDTMA sebanyak 0,2 g dan konsentrasi 400 ppm. Lebih lanjut pH optimum adsorpsi CR dari adsorben Alga-N, Alga-N-Ca dan Alga-N-HDTMA masing-masing adalah 8, 10 dan 7 sedangkan untuk MO adalah 9, 10 dan 8. Waktu kontak optimum untuk Alga-N dan Alga-N-Ca adalah 30 menit sedangkan untuk Alga-N-HDTMA 45 menit. Isoterm adsorpsi Alga-N dan Alga-N-Ca cenderung mengikuti model isoterm Freundlich, sementara Alga-N-HDTMA mengikuti model isoterm Langmuir. Adsorben Alga-N-HDTMA dapat digunakan secara berulang untuk adsorpsi CR hingga 3 siklus sedangkan untuk adsorpsi MO hingga 6 siklus dengan % teradsorpsi >50%.

Kata kunci: alga, *Nannochloropsis* sp., adsorpsi, desorpsi, surfaktan kationik.

ABSTRACT

ADSORPTION STUDY OF CONGO RED AND METHYL ORANGE DYES BY CATIONIC SURFACTANT-MODIFIED *Nannochloropsis* sp. BIOMASS

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In this study, the adsorption of the dyes Congo Red (CR) and Methyl Orange (MO) was carried out using *Nannochloropsis* sp. algae modified with CaCl_2 and the cationic surfactant HDTMA-Br as adsorbents. The modified adsorbents were characterized using Fourier Transform Infrared Spectroscopy (FTIR) to identify functional groups and Scanning Electron Microscopy with Energy Dispersive X-Ray (SEM-EDX) to analyze surface morphology and elemental composition. The concentrations of CR and MO dyes were determined using a UV-Vis spectrophotometer. Optimal adsorption of CR and MO occurred with 0.2 g of Alga-N, Alga-N-Ca, and Alga-N-HDTMA adsorbents at a dye concentration of 400 ppm. Furthermore, the optimum pH for CR adsorption using Alga-N, Alga-N-Ca, and Alga-N-HDTMA was 8, 10, and 7, respectively, while for MO it was 9, 10, and 8. The optimum contact time for Alga-N and Alga-N-Ca was 30 minutes, whereas for Alga-N-HDTMA it was 45 minutes. The adsorption isotherms of Alga-N and Alga-N-Ca tended to follow the Freundlich isotherm model, while Alga-N-HDTMA followed the Langmuir isotherm model. The Alga-N-HDTMA adsorbent could be reused for up to three cycles for CR adsorption and up to six cycles for MO adsorption, with an adsorption efficiency $> 50\%$.

Keywords: algae, *Nannochloropsis* sp., adsorption, desorption, cationic surfactant.