ABSTRAK

ADSORPSI MULTIKOMPONEN (ION Cu(II), METILEN BIRU, DAN KRISTAL VIOLET) PADA ADSORBEN HIBRIDA ALGA *Nannochloropsis* sp. SILIKA-MAGNETIT (Fe_3O_4)

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Pada penelitian ini telah dilakukan sintesis adsorben hibrida alga *Nannochloropsis* sp. dengan menggunakan silika sebagai matriks (HAS) dan pelapisan magnetit (HASM) sebagai adsorben campuran pasangan larutan metilen biru (MB) dan kristal violet (KV), serta larutan multikomponen. Karakterisasi material menggunakan Spektrofotometer Inframerah (IR) untuk mengidentifikasi gugus fungsi, *X-Ray Difraction* (XRD) untuk mengetahui tingkat kekristalan, *Scanning Eectron Microscopy with Energy Dispersive X-ray* (SEM-EDX) untuk mengetahui morfologi permukaan. Kadar MB dan KV dianalisis dengan Spektrofometer UV-Vis pada panjang gelombang masing-masing 664 dan 591 nm sedangkan kadar ion Cu(II) ditentukan dengan menggunakan Spektrofotometer Serapan Atom (SSA). Adsorpsi MB dan KV pada HAS dan HASM dipelajari meliputi variasi waktu, variasi konsentrasi, penggunaan ulang, dan mekanisme adsorpsi. Kinetika adsorpsi pada adsorben HAS dan HASM dalam campuran pasangan larutan MB dan KV, serta larutan multikomponen cenderung mendekati model kinetika pseudo orde dua dengan nilai koefisien korelasi (R^2) mendekati 1. Isoterm adsorpsi larutan MB dan KV dalam campuran pasangan larutan MB dan KV, serta larutan multikomponen pada adsorben HAS dan HASM cenderung mengikuti model isoterm Freundlich dengan nilai koefisien korelasi (R^2) mendekati 1. Penggunaan ulang adsorben HASM dilakukan sebanyak 5 kali dengan persen adsorpsi > 99%. Mekanisme adsorpsi MB pada HAS dan HASM didominasi oleh interaksi pertukaran ion.

Kata Kunci : *Nannochloropsis* sp., hibrida alga-silika, magnetit, adsorpsi-desorpsi, Metilen biru, Kristal violet, ion Cu(II).

ABSTRACT

ADSORPTION OF MULTICOPONENT OF (Cu(II) IONS, METHYENE BLUE, AND CRYSTAL VIOLET) ON HYBRID *Nannochloropsis* sp. ALGAE SILICA-MAGNETIT ADSORBENT

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It has been conducted synthesis of hybrid Nannochloropsis sp. algae adsorbent by using silica as a matrix (HAS) and magnetite coating (HASM) as an adsorbent of methylene blue (MB) and crystal violet (CV) mixture, as well as multicomponent solutions. Material characterization used Infrared Spectrophotometer (IR) to identify functional groups, X-Ray Difraction (XRD) to determine the level of crystallinity and Scanning Electron Microscopy with Energy Dispersive X-ray (SEM-EDX) to determine surface morphology. The MB and CV concentration were analyzed by UV-Vis Spectrophotometer at 664 and 591 nm wavelengths while Cu (II) ion concentration was determined using Atomic Absorption Spectrophotometer (AAS). The MB and CV adsorption on HAS and HASM were studied including time variation, concentration variation, reusability, and adsorption mechanism. The kinetics of adsorption on HAS and HASM adsorbents in a mixture of MB and CV solution pair as well as multicomponent solutions tend to approach the pseudo-second order kinetics model with a correlation coefficient (R^2) close to 1. The isotherm adsorption of MB and CV solutions in a pair of mixtures, and multicomponent solutions on HAS and HASM adsorbent tend to follow the Freundlich isotherm model with a correlation coefficient (R^2) close to 1. Reuse of HASM adsorbent is done 5 times with percent of adsorption> 99%. The MB adsorption mechanism on HAS and HASM is dominated by ion exchange interactions.

Keywords: *Nannochloropsis* sp., Hybrid algae-silica, magnetite, adsorption-desorption, Methylene blue, Crystal violet, Cu (II) ion.