ABSTRAK

MODIFIKASI BIOMASSA ALGA *Sargasssum sp.* DENGAN SURFAKTAN *HEXADECYLTRIMETHYLAMMONIUM BROMIDE* (HDTMA-Br) SEBAGAI ADSORBEN METILEN BIRU DAN *COOMASSIE BRILLIANT BLUE* DALAM LARUTAN

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Pada penelitian ini telah dilakukan modifikasi biomassa alga *Sargassum sp.* menggunakan surfaktan *Hexadecyltrimethylammonium Bromide* (HDTMA-Br) yang bertujuan mengubah permukaan alga yang bermuatan anionik menjadi lebih parsial positif. Adsorben yang dihasilkan adalah alga, alga-Na, dan alga-HDTMA untuk mengadsorpsi metilen biru dan CBB. Karakterisasi material adsorben dilakukan menggunakan FTIR dan SEM-EDX. Karakterisasi FTIR menunjukkan adanya gugus fungsi O-Na (1419,61 cm^{-1}) pada alga-Na dan adanya C-H dari kelompok metil surfaktan HDTMA (1465,90 cm^{-1}) pada alga-HDTMA. Karakterisasi SEM menunjukkan bahwa permukaan adsorben alga-Na terdapat butiran halus yang mengindikasikan keberadaan Na, sedangkan pada alga-HDTMA terdapat butiran lengket yang menandakan keberadaan HDTMA. Spektrum EDX menunjukkan adanya Na dan Br pada alga-Na dan alga-HDTMA. Hasil uji adsorpsi menunjukkan bahwa adsorpsi metilen biru optimum pada pH 6 (alga, alga-Na) dan 5 (alga-HDTMA), sedangkan CBB optimum pada pH 9 (alga, alga-Na) dan 6 (alga-HDTMA). Waktu kontak optimum metilen biru dan CBB adalah 15 dan 120 menit dengan konsentrasi optimum 300 mg/L. Kinetika adsorpsi metilen biru dan CBB cenderung mengikuti kinetika pseudo orde dua dan isoterm adsorpsinya cenderung mengikuti pola isoterm Freundlich. Hasil uji terhadap pasangan bikomponen menunjukkan alga-Na cenderung lebih baik dalam mengadsorpsi metilen biru dan alga-HDTMA cenderung lebih baik mengadsorpsi CBB. Mekanisme adsorpsi dilakukan pada alga-HDTMA untuk adsorpsi CBB dan menunjukkan bahwa interaksinya didominasi oleh interaksi elektrostatik, dan alga-HDTMA efektif digunakan untuk adsorpsi CBB sebanyak tiga kali siklus penggunaan dengan persentase adsorpsi di atas 70%.

Kata kunci : adsorpsi, CBB, HDTMA-Br, metilen biru, *Sargassum sp.*

ABSTRACT

MODIFICATION OF *Sargassum sp.* ALGAE BIOMASS WITH HEXADECYLTRIMETHYLAMMONIUM BROMIDE (HDTMA-Br) SURFACTANT AS METHYLENE BLUE AND COOMASSIE BRILLIANT BLUE ADSORBENT IN SOLUTION

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In this study, modification of *Sargassum sp.* algae biomass has been carried out using the Hexadecyltrimethylammonium Bromide (HDTMA-Br) surfactant aimed at changing the surface of anionic-charged algae to a more partially positive. The resulting adsorbents are algae, algae-Na, and algae-HDTMA to be used as adsorbent of methylene blue and CBB. The adsorbents were characterized by FTIR and SEM-EDX. The characterization of FTIR indicates the presence of the O-Na functional group (1419.61 cm^{-1}) in algae-Na and the presence of C-H from the methyl group of HDTMA surfactant (1465.90 cm^{-1}) in algae-HDTMA. SEM characterization indicates of that the surface of algae-Na adsorbent has fine grains indicating the presence of Na, while in algae-HDTMA there are sticky grains that indicate the presence of HDTMA. The EDX spectrum indicates the presence of Na and Br in algae-Na and algae-HDTMA. The results of the adsorption test showed that methylene blue adsorption was optimal at pH 6 (algae, algae-Na) and 5 (algae-HDTMA), while the optimum CBB at pH 9 (algae, algae-Na) and 6 (algae-HDTMA). The optimum contact time of methylene blue and CBB is 15 and 120 mins with an optimum concentration of 300 mg/L. Adsorption kinetics of methylene blue and CBB tend to follow pseudo-second-order kinetics and their adsorption isotherms tend to follow the Freundlich isotherm pattern. Test results on bicomponent pairs showed that algae-Na tends to be better at adsorbing methylene blue and algae-HDTMA tends to better adsorbing CBB. The adsorption mechanism was performed on algae-HDTMA for CBB adsorption and showed was dominated by electrostatic interactions, and algae-HDTMA was effectively used for CBB adsorption as many as three cycles of use with an adsorption percentage above 70%.

Keywords : adsorption, CBB, HDTMA-Br, methylene blue, *Sargassum sp.*