ABSTRAK

MODIFIKASI BIOMASSA ALGA *SARGASSSUM* sp. MENGGUNAKAN SURFAKTAN *CETHYL TRYMETHYL AMMONIUM CHLORIDE* (CTAC) SEBAGAI ADSORBEN ZAT WARNA *COOMASSIE BRILLIANT BLUE* (CBB) DAN ION FOSFAT DALAM LARUTAN.

Oleh

Ahmad Barep Prayogo

Pada penelitian ini telah dilakukan modifikasi biomassa alga *Sargassum* sp. menggunakan surfaktan *Cethyl Trymethyl Ammonium Chloride* (CTAC) yang bertujuan mengubah permukaan alga yang bermuatan anionik menjadi lebih parsial positif untuk mengadsorpsi CBB dan fosfat. 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 CTAC (1342,46 cm^{-1}) pada alga-CTAC. Karakterisasi SEM menunjukkan bahwa permukaan adsorben alga-Na terdapat butiran halus yang mengindikasikan keberadaan Na sedangkan pada alga-CTAC terdapat butiran lengket yang menandakan keberadaan CTAC. Spektrum EDX menunjukkan adanya unsur Na pada alga-Na dan unsur Cl tidak terdeteksi karena memiliki keelektronegatifan tinggi sehingga larut saat proses pembuatan alga-CTAC. Hasil uji adsorpsi menunjukkan bahwa adsorpsi CBB optimum pada pH 3 untuk alga, alga-Na dan alga-CTAC sedangkan fosfat optimum pada pH 6 (alga-Na dan alga-CTAC) dan 4 (alga). Waktu kontak optimum CBB adalah 90 (alga), 150 (alga-Na) dan 120 menit (alga-CTAC) sedangkan fosfat 60 (alga dan alga-Na), 120 menit (alga-CTAC) dengan konsentrasi optimum 300 dan 200 mg/L. Kinetika adsorpsi CBB dan anion fosfat cenderung mengikuti kinetika pseudo orde dua dan isoterm adsorpsinya cenderung mengikuti pola isoterm Freundlich. Hasil uji terhadap pasangan bikomponen menunjukkan alga-CTAC cenderung lebih baik dalam mengadsorpsi CBB dan anion fosfat. Mekanisme adsorpsi dilakukan pada alga-CTAC untuk adsorpsi CBB dan fosfat serta menunjukkan bahwa interaksinya didominasi oleh interaksi elektrostatik, selanjutnya alga-CTAC efektif digunakan untuk adsorpsi CBB dan anion fosfat sebanyak tiga kali siklus penggunaan dengan Q untuk CBB di atas 40 mg/g serta anion fosfat di atas 60 mg/g.

Kata kunci : adsorpsi, CBB, CTAC, fosfat, *Sargassum* sp.

ABSTRAK

MODIFICATION OF BIOMASS ALGAE SARGASSSUM sp. USING CETHYL TRYMETHYL AMMONIUM CHLORIDE (CTAC) SURFACTANT AS AN ADSORBENT OF COOMASSIE BRILLIANT BLUE (CBB) DYE AND phosphate IONS IN SOLUTION.

By

Ahmad Barep Prayogo

In this research, modification of the biomass of *Sargassum* sp. algae has been carried out. using Cethyl Trymethyl Ammonium Chloride (CTAC) surfactant which aims to change the surface of algae which has anionic charge to be more partially positive to adsorb CBB and phosphate. The characterization of the adsorbent material was carried out using FTIR and SEM-EDX. FTIR characterization showed the presence of the O-Na functional group (1419.61 cm-1) in the Na-algae and the presence of C-H from the CTAC surfactant methyl group (1342.46 cm-1) in the algae- CTAC. SEM characterization showed that the surface of the Na-algae adsorbent contained fine grains indicating the presence of Na while on the CTAC-algae there were sticky grains indicating the presence of CTAC. The EDX spectrum showed the presence of Na in the algae-Na and Cl was not detected because it has a high electronegativity so it dissolves during the algae-CTAC manufacturing process. The adsorption test results showed that CBB adsorption was optimum at pH 3 for algae, alga-Na and alga-CTAC while for phosphate optimum at pH 6 (algae-Na and alga-CTAC) and Ph 4 (algae). Optimum contact time for CBB was 90 (algae), 150 (algae-Na) and 120 minutes (algae-CTAC) while phosphate was 60 (algae and algae-Na), 120 minutes (algae-CTAC) with optimum concentrations of 300 and 200 mg /l. The adsorption kinetics of CBB and phosphate anions 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-CTAC tended to be better at adsorbing CBB and phosphate anions. The adsorption mechanism was carried out on alga-CTAC for CBB and phosphate adsorption and showed that the interaction was dominated by electrostatic interactions, then algae-CTAC was effectively used for adsorption of CBB and phosphate anions for three cycles of use with Q for CBB above 40 mg/g and phosphate anions above 60 mg/g.

Key words : adsorption, CBB, CTAC, phospat, *Sargassum* sp.