ABSTRACT

SYNTHESIS AND CHARACTERIZATION OF *Spirulina* sp. ALGAE BIOMASS MODIFIED SILICA-MAGNETITE AS ADSORBENT OF A CRYSTAL VIOLET DYE

By

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In this research, it has been conducted synthesis of *Spirulina* sp. algae hybrid with silica matrix (HAS) and modified by coating magnetite particles (Fe_3O_4) (HASM) to be used as adsorbent of crystal violet dye in the solution. Characterizations of HAS and HASM materials with infrared spectrophotometer (*IR*) were used to investigate a functional groups, *X-Ray Diffraction* (*XRD*) was used for analyzing of crystalline levels, and *Scanning Electron Microscopy With Energy Dispersive X-ray* (*SEM-EDX*) was conducted to identify the surface and elemental constituents of the materials. While, spectrophotometer of UV-Vis was used to analyze the maximum wavelength of crystal violet in solution. The result showed that the adsorpstion is optimum at pH 8 within 120 minutes with a concentration of crystal violet is 400 mg/L and at a maximum wavelength of crystal violet of 591 nm. Adsorption kinetics of crystal violet by HAS and HASM tend to follow pseudo second order kinetic model with the adsorption rate of HAS material of 0,0361 g mg^{-1} $menit^{-1}$ and HASM material of 0,0227 g mg^{-1} $menit^{-1}$ as well as Freundlich isotherm model with the energy of adsorption less than 20.92 kJ mol^{-1} indicating physical adsorption.

Kata kunci : *Spirulina* sp. algae biomass, magnetite, adsorption, crystal violet.

ABSTRAK

SINTESIS DAN KARAKTERISASI BIOMASSA ALGA *Spirulina* sp. TERMODIFIKASI SILIKA-MAGNETIT SEBAGAI ADSORBEN ZAT WARNA KRISTAL VIOLET

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Pada penelitian ini telah dilakukan sintesis hibrida alga *Spirulina* sp. dengan matriks silika (HAS) dan dimodifikasi dengan teknik pelapisan menggunakan partikel magnetit (Fe_3O_4) (HASM) untuk digunakan sebagai adsorben zat warna kristal violet dalam larutan. Karakterisasi material HAS dan HASM dengan spektrofotometer *IR* digunakan untuk mengetahui gugus fungsional, *X-Ray Diffraction* (*XRD*) digunakan untuk analisis tingkat kekristalan, dan *Scanning Electron Microscopy With Energy Dispersive X-ray* (*SEM-EDX*) untuk mengidentifikasi morfologi permukaan dan konstituen unsur. Hasil adsorpsi menunjukkan bahwa adsorpsi ini optimum dilakukan pada pH 8 dalam waktu 120 menit dengan konsentrasi kristal violet 400 mg/L dan dianalisis menggunakan spektrofotometer *UV-Vis* pada panjang gelombang maksimum kristal violet 591 nm. Kinetika adsorpsi kristal violet oleh HAS dan HASM cenderung mengikuti model kinetika pseudo orde dua dengan laju adsorpsi material HAS sebesar 0,0361 g mg^{-1} $menit^{-1}$ dan HASM sebesar 0,0227 g mg^{-1} $menit^{-1}$ dan model isoterm Freundlich dengan energi adsorpsi kurang dari 20,92 kJ mol^{-1} yang mengindikasikan adsorpsi terjadi secara fisika.

Kata kunci : Biomassa alga *Spirulina* sp., magnetit, adsorpsi, kristal violet.