

ABSTRACT

ADSORPTION OF MULTICOMPONENT SOLUTION OF Cu(II) IONS, METHYLENE BLUE, AND CRYSTAL VIOLET ON ADSORBENT BIOMASS *Porphyridium* sp. SILICA-MAGNETITE (Fe₃O₄)

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This study has been carried out the synthesis of the hybrid adsorbent algae *Porphyridium* sp. using silica coating (HA-S) and *Porphyridium* sp. algae hybrid with magnetite silica coating technique, Fe₃O₄ (HA-SM). The synthesized adsorbent was characterized using an infrared spectrophotometer (IR) to identify the functional groups contained in the adsorbent, X-Ray Diffraction (XRD) to determine the crystallinity is mainly modify by HA-S and magnetite and then Scanning Electron Microscopy with Energy Dispersive X-Ray (SEM-EDX) to analyze surface morphology and element composition in the adsorbent. The results of crystal violet (CV) and methylene blue (MB) dyes solution and the multicomponent solution adsorption of Cu(II) ions, (MB), and (CV) on HA-S and HA-SM were analyzed using a UV-VIS spectrophotometer and Atomic Absorption Spectrophotometer (AAS). The optimum of dyes solution and the multicomponent solution adsorption for HA-S and HA-SM adsorbents occurred at pH 8 with a contact time of 90 and 15 minutes respectively. The rate of dyes solution and the multicomponent solution adsorption on HA-S and HA-SM tends to follow the second order pseudo kinetics model. The dyes solution and the multicomponent solution adsorption isotherms for HA-S and HA-SM tend to follow Freundlich isotherm model. The reusability of HA-S and HA-SM adsorbent to adsorption MB was succeed as much as 7 times repetition with the repeat cycle with % MB adsorb >80%.

Keyword: *Porphyridium* sp., adsorption, multicomponent, HA-S, HA-SM.

ABSTRAK

ADSORPSI MULTIKOMPONEN ION Cu(II), METILEN BIRU, DAN KRISTAL VIOLET OLEH ADSORBEN BIOMASSA *Porphyridium* sp. SILIKA-MAGNETIT (Fe₃O₄)

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Pada penelitian ini telah dilakukan sintesis adsorben hibrida alga *Porphyridium* sp. menggunakan teknik pelapisan silika (HA-S) dan hibrida alga *Porphyridium* sp. dengan teknik pelapisan silika magnetit, Fe₃O₄ (HA-SM). Adsorben hasil sintesis dikarakterisasi menggunakan spektrofotometer inframerah (IR) untuk mengidentifikasi gugus fungsi pada adsorben, *X-Ray Diffraction* (XRD) untuk menentukan tingkat kekristalan dari hasil modifikasi HA-S dan magnetit, serta *Scanning Electron Microscopy with Energi Dispersive X-Ray* (SEM-EDX) untuk menganalisis morfologi permukaan dan komposisi unsur dalam adsorben. Hasil adsorpsi pasangan larutan zat warna kristal violet (KV) dan metilen biru (MB) serta larutan multikomponen ion Cu(II), MB, dan KV terhadap HA-S dan HA-SM dianalisis dengan menggunakan spektrofotometer UV-Vis dan spektrofotometer serapan atom (SSA). Tingkat optimum adsorpsi pasangan larutan zat warna dan larutan multikomponen terhadap HA-S dan HA-SM terjadi pada pH 8 dengan waktu kontak masing-masing 90 dan 15 menit. Laju adsorpsi pasangan larutan zat warna dan larutan multikomponen terhadap HA-S dan HA-SM cenderung mengikuti model kinetika pseudo orde dua. Isoterm adsorpsi pasangan larutan zat warna dan larutan multikomponen terhadap HA-S dan HA-SM cenderung mengikuti model isoterm Freundlich. Adsorben HA-S dan HA-SM dapat digunakan secara berulang untuk mengadsorpsi MB sebanyak 7 kali siklus pengulangan dengan % MB teradsorpsi > 80%.

Kata kunci : *Porphyridium* sp., adsorpsi, multikomponen, HA-S, HA-SM.