

ABSTRACT

ADSORPTION-DESORPTION TEST OF MONOLOGAM (Ni(II), Cu(II), Cd(II)) AND MULTILOGAM SOLUTION ON THE ALGAE BIOMASS *Porphyridium* sp. MATERIAL MODIFIED WITH SILICA – MAGNETITE (Fe₃O₄)

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Adsorption-desorption test of monometal ion Ni(II), Cd(II), Cu(II) and multimetal ions Ni(II), Cd(II), Cu(II), Pb(II), and Zn(II) in aqueous solution, chemical stability, and reusability of the algae biomass *Porphyridium* sp. material modified with silica-magnetite (Fe₃O₄) coating have been done through of adsorption experiment series with batch method. The synthesis result material was characterized with an infrared spectrophotometer (IR) to identify the functional groups, X-ray diffraction (XRD) to determine the crystal classification, and scanning electron microscope with energy dispersive X-ray (SEM-EDX) to determine surface morphology and constituent elements. The metal ion concentration was characterized with atomic absorption spectrophotometer (AAS). The desorption test was performed by using eluents consisting of water, HCl, and Na₂EDTA. The adsorption-desorption data of monometal solution follow these order: Cd(II)>Cu(II)>Ni(II) ion. The adsorption-desorption data of multimetal solution each follow these order: Pb(II)>Cd(II)>Zn(II)>Cu(II)>Ni(II) ions and Zn(II)>Cd(II)>Cu(II) >Ni(II) >Pb(II) ions. Chemical stability on HAS-M material was determined in solution media of acid, neutral, and base condition with the interval of time 4 days. Magnetite algae silica hybrid material (HAS-M) *Porphyridium* sp. was very stable in acid media and low stability in neutral and base media. Reusability of HAS-M material is quite effective, and it can be reused at 4 cycles of repetition.

Keyword: adsorption, desorption, algae *Porphyridium* sp., HAS-M, heavy metals.

ABSTRAK

UJI ADSORPSI-DESORPSI LARUTAN MONOLOGAM (Ni(II), Cu(II), Cd(II)) DAN MULTIOLOGAM PADA MATERIAL BIOMASSA ALGA *Porphyridium* sp. YANG DIMODIFIKASI DENGAN PELAPISAN SILIKA-MAGNETIT (Fe₃O₄)

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Uji Adsorpsi-desorpsi larutan monologam ion Ni(II), Cd(II), Cu(II) dan multilogam ion Ni(II), Cd(II), Cu(II), Pb(II), dan Zn(II), serta stabilitas kimia, dan kemampuan penggunaan ulang pada material biomassa alga *Porphyridium* sp. yang dimodifikasi dengan pelapisan silika-magnetit (Fe₃O₄) telah dilakukan melalui serangkaian eksperimen adsorpsi dengan metode *batch*. Material hasil sintesis dikarakterisasi dengan menggunakan spektrofotometer inframerah (IR) untuk mengidentifikasi gugus fungsional, *X-ray diffraction* (XRD) untuk mengetahui tingkat kekristalan, dan *scanning electron microscope with energy dispersive X-ray* (SEM-EDX) untuk mengetahui morfologi permukaan serta konstituen unsur. Kadar ion logam dianalisis dengan spektrofotometer serapan atom (SSA). Uji desorpsi dilakukan dengan menggunakan eluen akuades, HCl, dan Na₂EDTA. Data adsorpsi-desorpsi larutan monologam memiliki urutan sebagai berikut: ion Cd(II)>Cu(II)>Ni(II). Data adsorpsi-desorpsi larutan multilogam masing-masing menunjukkan urutan sebagai berikut: ion Pb(II)>Cd(II)>Zn(II)>Cu(II)>Ni(II) dan ion Zn(II)>Cd(II)>Cu(II)>Ni(II)>Pb(II). Stabilitas kimia material HAS-M ditentukan dalam media larutan asam, netral dan basa dalam rentang waktu selama 4 hari. Material hibrida alga silika magnetit (HAS-M) *Porphyridium* sp. sangat stabil dalam media asam dan kurang stabil dalam media netral dan basa. Penggunaan ulang material HAS-M cukup efektif digunakan kembali pada 4 siklus pengulangan.

Kata kunci: adsorpsi, desorpsi, alga *Porphyridium* sp., HAS-M, logam berat.