MICROWAVE-MODIFIED COASTAL PLANT, *CASUARINA EQUISETIFOLIA* SEEDS AS ADSORBENTS FOR ADSORPTION OF METHYLENE BLUE DYE

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Lihat Sebelah

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By

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VERIFICATION AND APPROVAL FORM

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I hereby declare that this thesis entitled *Microwave-Modified Coastal Plant, Casuarina Equisetifolia Seeds As Adsorbents For Adsorption Of Methylene Blue Dye* is the result of my own research except as cited in the references.

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ABSTRACT

An increasing use of dyes for product coloring has resulted in a huge volume of colored water. *Casuarina equisetifolia* seeds, an eco-friendly plant waste were used to develop a microwave and chemically treated adsorbent to remove methylene blue (MB) dye from aqueous solution. This study was conducted to determine the characteristics of adsorbent and effects of dosage of adsorbent on concentration of methylene blue dyes removed as well as applicability of Langmuir and Freundlich isotherms. The characteristics of adsorbent were investigated using scanning electron microscopy (SEM), Fourier-transform infrared spectroscopy (FTIR), Brunaeur-Emmet-Teller (BET) surface area analyzer, elemental analyzer and electro kinetic analyzer (EKA). Adsorption experiments were performed based on adsorbent dosage parameter by using batch adsorption method. The Langmuir and Freundlich isotherms were employed to interpret the adsorption behavior. The adsorption of MB dye on *C. equisetifolia* seeds was confirmed by the presence of carboxylic acid and hydroxyl functional groups based on the FTIR spectrum. Other than that, morphology, surface area and surface charge analysis also supported the results of methylene blue dye adsorption. The best adsorbent dosage is 1 gram with 92.4% dye removal. Experimental data describes the adsorption behavior followed Langmuir isotherm model. The results imply that *C. equisetifolia* seeds are a potentially low-cost adsorbent for treating wastewater containing cationic dyes.

BIJI TUMBUHAN PANTAI, *CASUARINA EQUISETIFOLIA* TERUBAH SUAI SECARA GELOMBANG MIKRO SEBAGAI PENJERAP UNTUK PENJERAPAN PEWARNA BIRU METILENA

ABSTRAK

Peningkatan penggunaan pewarna untuk pewarnaan produk telah menghasilkan umlah air berwarna yang banyak. Biji *Casuarina equisetifolia*, bahan buangan mesra alam telah digunakan untuk membangunkan penjerap secara gelombang mikro dan rawatan kimia untuk menjerap pewarna biru metalina (MB) dari larutan. Kajian ini dijalankan untuk menentukan ciri-ciri bahan penjerap dan kesan dos penjerap kepada kepekatan pewarna biru metilena dikeluarkan serta aplikasi Langmuir dan Freundlich isoterma. Ciri-ciri penjerap telah dikaji dengan menggunakan mikroskop elektron pengimbas (SEM), Fourier-mengubah spektroskopi inframerah (FTIR), Brunaeur-Emmet-Teller (BET) penganalisis luas permukaan, penganalisis unsur dan elektro penganalisis kinetik (EKA). Eksperimen penjerapan telah dijalankan berdasarkan parameter dos penjerap dengan menggunakan kaedah kumpulan penjerapan. Langmuir dan Freundlich isoterma telah digunakan untuk mentafsir tingkah laku penjerapan. Penjerapan MB pewarna di atas biji *C. equisetifolia* telah disahkan oleh kewujudan kimia berfungsi asid karboksilik dan kumpulan hidroksil berdasarkan spectrum FTIR. Selain daripada itu, morfologi, luas permukaan dan analisis caj permukaan juga menyokong keputusan penjerapan pewarna biru metalina. Penjerap dos terbaik adalah 1 gram dengan 92.4% penyingkiran pewarna. Data uji kaji menerangkan tingkah laku penjerapan yang sejajar dengan model isoterma Langmuir. Keputusan menunjukkan bahawa biji *C. equisetifolia* adalah penjerap kos rendah berpotensi untuk merawat air sisa yang mengandungi pewarna kationik.