

**AN INVESTIGATION OF BAMBOO CHARCOAL POTENTIAL AS
METHYLENE BLUE DYE REMOVER**

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DECLARATION

I hereby declare that this thesis entitled An Investigation of Bamboo Charcoal Potential as Methylene Blue Dye Remover is the result of my own research except as cited in the references.

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AN INVESTIGATION OF BAMBOO CHARCOAL POTENTIAL AS METHYLENE BLUE DYE REMOVER

ABSTRACT

Dyes production industry such as textile, produces wastewater which is high in color and organic content. The presence of Methylene Blue, MB dye in discharged water is hazardous for human beings. Most common adsorbent used for decolorization is from chemical approach that often high cost and environment disadvantage. Therefore, the potential of bamboo charcoal powder for MB removal is studied. Operating variables studied were pyrolysis temperature, initial MB concentration, adsorbent dosage and also the contact time. The adsorption capacity of MB increases with the increase of pyrolysis temperature, contact time and adsorbent dosage but decreases with the increasing of initial MB concentration. The adsorption percentage studied for different pyrolysis temperature and different initial MB concentration, reached 28.831% at pyrolysis temperature 900°C with initial concentration of 10%. The adsorbent dosage at 0.10g and 0.15g seems to be overdose for initial MB concentration of 20%. However, the adsorption percentage reached 66.940% when reacted with 0.15g bamboo charcoal powder at pyrolysis temperature 900°C, also with initial concentration 20%. By effect of contact time, the adsorption percentage of bamboo charcoal powder at pyrolysis temperature of 900°C reached 77.6755% within 90 minutes of reaction with initial concentration 20%. The morphology of bamboo charcoal powder at pyrolysis temperature 500°C, 700°C and 900°C was captured at variety of magnification scales which are x2500, x5000 and x7500 using the Scanning Electrons Microscopy (SEM) and it shows that the pores of bamboo charcoal powder at pyrolysis temperature 900°C seem wider compared to bamboo charcoal powder at pyrolysis temperature 500°C and 700°C. The Fourier Transform Infrared (FTIR) results showed that the functional group that might occur in MB solution was alkenes with $-C=C-$ stretch, aliphatic amines with $C-N$ stretch, alkynes with $C-H$ bending and also alkyl halides with $C-Cl$ stretch. Most of the functional groups occurred in bamboo charcoal powder denotes the presence of carbon.

KAJIAN TERHADAP POTENSI ARANG BULUH SEBAGAI PENYERAP PEWARNA METILENA BIRU

ABSTRAK

Industri yang melibatkan pengeluaran pewarna-pewarna, contohnya industri tekstil, mengeluarkan sisa kumbahan yang mengandung sisa pewarna dan bahan organik yang tinggi. Kehadiran pewarna Metilena Biru, MB dalam air kumbahan adalah berbahaya kepada manusia. Bahan yang biasa digunakan untuk pelunturan warna adalah bahan kimia yang biasanya mahal dan memudaratkan alam sekitar. Oleh itu, potensi serbuk arang buluh dikaji dalam konteks pelunturan pewarna MB. Pembolehubah yang dikaji adalah suhu pembakaran, kepekatan awal MB, dos penyerap dan masa tindak balas berlaku. Kapasiti penyerapan MB meningkat apabila suhu pembakaran, masa tindak balas dan dos penyerap bertambah, tetapi berkurangan apabila kepekatan awal MB meningkat. Dalam kajian kesan suhu pembakaran dan kesan kepekatan awal MB yang berlainan, peratus penyerapan mencapai 28.831% pada suhu pembakaran 900°C dan kepekatan awal MB 10%. Dos penyerap sebanyak 0.10g dan 0.15g didapati berlebihan untuk larutan MB berkepekatan awal 20%. Walaubagaimanapun, peratus penyerapan serbuk arang buluh pada suhu pembakaran 900°C mencapai 66.940% dalam tindak balas 0.15g serbuk arang buluh dalam larutan MB berkepekatan awal 20%. Dalam kajian kesan masa tindak balas, peratus penyerapan serbuk arang buluh pada suhu pembakaran 900°C dan kepekatan awal MB 20% mencapai 77.6755% dalam masa 90 minit eksperimen. Imej morfologi serbuk arang buluh yang dibakar pada suhu 500°C, 700°C dan 900°C diperoleh pada skala pembesaran yang berbagai, antaranya x2500, x5000 and x7500 menggunakan mesin Scanning Electrons Microscopy (SEM) dan keputusan menunjukkan liang yang terdapat pada serbuk arang buluh pada suhu pembakaran 900°C adalah lebih lebar berbanding serbuk arang buluh pada suhu pembakaran 500°C dan 700°C. Keputusan Fourier Transform Infrared (FTIR) pula menunjukkan kumpulan berfungsi yang mungkin didapati dalam larutan MB adalah *alkenes* dengan tarikan $-C=C-$, *aliphatic amines* dengan tarikan $C-N$, *alkynes* dengan ikatan $C-H$ serta *alkyl halides* dengan tarikan $C-Cl$. Kebanyakan kumpulan berfungsi yang hadir dalam serbuk arang buluh menyatakan kehadiran karbon.