CONVERSION OF WASTE BANANA PEEL INTO ACTIVATED CARBON USING MICROWAVE PYROLYSIS

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CONVERSION OF WASTE BANANA PEEL INTO ACTIVATED CARBON USING MICROWAVE PYROLYSIS

By
ELFINA BINTI AZWAR

A PITA report submitted in partial fulfilment of
the requirements for the award of the degree of
Bachelor of Technology (Environment)

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VERIFICATION AND APPROVAL FORM

This PITA research report entitled *Conversion of Waste Banana Peel into Activated Carbon Using Microwave Pyrolysis* prepared and submitted by Elfina Binti Azwar, Matric No. UK29494 in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology (Environment) has been examined and is recommended for approval of acceptance.

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DECLARATION

I hereby declare that this PITA research report entitled *Conversion of Waste Banana Peel into Activated Carbon Using Microwave Pyrolysis* is the result of my own research except as cited in the references.

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CONVERSION OF WASTE BANANA PEEL INTO ACTIVATED CARBON USING MICROWAVE PYROLYSIS

ABSTRACT

Biomass recovery is very important in agricultural waste management as it solves the waste disposal problems effectively by not disposing the wastes through current disposal method like landfilling and incineration. The current disposal method produces secondary pollution like leachate, smog and ash which need further treatment. In this experiment, the waste banana peel was converted into activated carbon by chemical activation using microwave pyrolysis. The chemical activation using potassium hydroxide and sodium hydroxide increases the pore size distribution on the surface of activated carbon. The effect of microwave power towards microwave pyrolysis was studied at several microwave power adjustment (300W, 500W and 700W) to determine highly porous activated carbon. The activated carbon was further studied for its chemical and physical properties using Scanning Electron Microscope (SEM) to determine the morphological characteristics, Fourier Transform Infrared analysis (FTIR) to identify the functional group on the surface, and Thermogravimetry analysis (TGA) to determine the contents of moisture, ash, volatile matter and fixed carbon. The activated carbon produced from high microwave power (700 W) had high porosity and fixed carbon content (87 wt%) with low ash content (5 wt%). The findings from this research was fundamental to improve the quality of wastewater using activated carbon from microwave pyrolysis of banana peel.

PENUKARAN SISA KULIT PISANG KE KARBON TERAKTIF MENGGUNAKAN PIROLISIS GELOMBANG MIKRO

ABSTRAK

Pemulihan biomas adalah sangat penting dalam pengurusan sisa pertanian kerana ia mampu untuk menyelesaikan masalah pelupusan sisa secara efektif dengan tidak melupuskannya melalui kaedah semasa seperti penimbusan dan pembakaran. Kaedah pelupusan ini menghasilkan pencemaran sekunder seperti air larut lesap, kabut dan abu dimana ia memerlukan rawatan lanjutan. Di dalam eksperimen ini, kulit pisang ditukar menjadi arang hayati melalui proses karbonisasi di dalam gelombang mikro. Penyerapan kimia menggunakan kalium hidroksida dan natrium hidroksida dengan arang hayati meningkatkan lagi taburan saiz pori di permukaannya. Arang yang diserap dengan kimia ini ditukarkan menjadi karbon teraktif menggunakan pirolisis gelombang mikro pada beberapa penyesuaian kuasa gelombang mikro (300W, 500W dan 700W) untuk mendapatkan karbon teraktif yang mempunyai keliangan yang tinggi. Produk karbon teraktif tersebut dikaji dengan lebih mendalam untuk mengetahui ciri-cirinya meggunakan Scanning Electron Microscope (SEM) untuk mengetahui ciri-ciri morfologi, Fourier Transform Infrared Analysis (FTIR) untuk mengetahui kumpulan fungsi permukaan dan Thermogravimetry Analysis untuk mengetahui kandungan kelembapan, abu, bahan meruap dan karbon tetap. Karbon teraktif yang dihasilkan daripada kuasa gelombang mikro yang tinggi (700 W) mempunyai keliangan dan kandungan karbon tetap yang tinggi (87 % berat) dengan kandungan abu yang rendah (5 % berat). Hasil dapatan daripada kajian ini adalah sangat penting untuk meningkatkan kualiti air sisa menggunakan karbon teraktif daripada pirolisis gelombang mikro kulit pisang.