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A STUDY OF NO REDUCTION EMITTED FROM THE COMBUSTION OF OIL
PALM FIBRE BY ADSORPTION USING COCONUT SHELL BASED
ACTIVATED CARBON (CSAC)

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**JABATAN SAINS KEJURUTERAAN
FAKULTI SAINS DAN TEKNOLOGI
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**BORANG PENGAKUAN DAN PENGESAHAN LAPORAN
PROJEK PENYELIDIKAN I DAN II**

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk:

A STUDY OF NO REDUCTION EMITTED FROM THE COMBUSTION OIL PALM FIBRE BY ADSORPTION USING COCONUT SHELL BASED ACTIVATED CARBON (CSAC) oleh SANDRA CASOVIA No. Matrik UK8785 telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Kejuruteraan sebagai memenuhi sebahagian daripada keperluan memperoleh ijazah SARJANA MUDA TEKNOLOGI (ALAM SEKITAR), Fakulti Sains dan Teknologi, Universiti Malaysia Terengganu.

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LIST OF ABBREVIATIONS / SYMBOLS

Abbreviation/ Symbols

°C	Celsius
°F	Fahrenheit
m ² /g	meter square per gram
CSAC	Coconut shell activated carbon
GAC	Granular activated carbon
GDP	Gross Development Product
NAAQS	National Ambient Air Quality Standard
N ₂	Nitrogen
NO	Nitric oxide
NO ₂	Nitrogen dioxide
O ₂	Oxygen
PSAC	Palm Shell activated carbon
ppb	Parts per billion
ppm	Parts per million
Tg	Tonne gram
UMT	University Malaysia Terengganu
VOC	Volatile organic compound
WHO	World Health Organization

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ABSTRACT

Adsorption with activated carbon has been widely known as one of the most practical techniques in water and wastewater treatment. However, not much known regarding the effectiveness of activated carbon in air treatment as only a few study have been carried out. Solid wastes from palm oil industry such as mesocarp fibres and shells are the main sources of energy in the palm oil mills. However, a large quantity of it is either burned in open air or discarded in closest area to the mill, which creates massive environmental and disposal problems. The objectives of this study was to introduce a novel, low cost and efficient unit to reduce air pollutants from the combustion of palm oil fibre and to reduce the amount of NO emitted from the combustion of palm oil industry by adsorption using coconut shell based activated carbon. The coconut shell based activated carbons were supplied by UMT while the oil palm fibres were obtained from a palm oil mill in Chalok, Setiu. In research method, the readings of NO concentration were taken from before and after adsorption with 1 L/min and repeated with 2 L/min, 3 L/min and 4 L/min. The results were presented in graphs using software programmed namely Statgraphic and Microsoft Excel. Based on the results, showing that the best flow rate for NO adsorption using CSAC was 1 L/min with 51% of removal efficiency while by using PSAC, the best flow rate was 2 L/min with the efficiency of 43.04%. The adsorption period for CSAC is longer which in the duration of 15 minutes than PSAC that only capable to adsorb the adsorbate for the first 8 minutes before reaching the saturation point thus deduced that adsorption of NO is more efficient by using CSAC compared to PSAC. The equations formed from the Statgraphic showing the inverse proportional relationship between percentage of efficiency with flow rate.

ABSTRAK

Kaedah penjerapan menggunakan karbon teraktif dalam merawat air dan air kumbahan sudah diketahui umum. Namun demikian, tidak banyak yang diketahui berkenaan keberkesanan kaedah ini dalam perawatan udara memandangkan hanya sedikit kajian dijalankan. Sisa pepejal yang dihasilkan daripada pemprosesan kelapa sawit seperti serabut *mesocarp* dan tempurung merupakan sumber tenaga utama di kilang kelapa sawit. Walau bagaimanapun, sebahagian besar kuantiti sisa tersebut samada dibakar ataupun dibuang ke kawasan yang berdekatan dengan kilang yang mana akan mendatangkan masalah persekitaran. Objektif kajian adalah untuk memperkenalkan sebuah unit pengurang pencemar udara yang murah namun berkesan dalam mengurangkan bahan pencemar udara hasil daripada pembakaran serabut kelapa sawit dan mengurangkan kandungan NO yang terhasil daripada pembakaran serabut kelapa sawit menggunakan karbon teraktif yang diperbuat daripada kelapa. Karbon teraktif ini dibekalkan oleh pihak UMT manakala serabut kepala sawit diperolehi daripada kilang kelapa sawit Chalok di Setiu. Parameter yang akan dikaji ialah NO. Dalam kaedah kajian, bacaan diambil sebelum dan selepas penjerapan menggunakan kadar alir 1 L/min dan kaedah diulangi menggunakan kadar alir 2 L/min, 3 L/min dan 4 L/min. Data-data yang direkodkan akan dipersembahkan dalam bentuk graf menggunakan program software, Statgraphic dan Microsoft Excel. Daripada keputusan yang diperolehi menunjukkan bahawa kadar alir yang paling baik kadar penjerapan NO menggunakan CSAC ialah pada 1 L/min dengan peratusan kecekapan pengurangan sebanyak 73% manakala dengan menggunakan PSAC, kadar alir dengan peratusan kecekapan pengurangan sebanyak 43% ialah pada 2 L/min. Tempoh penjerapan bagi CSAC lebih lama iaitu dalam durasi 15 minit berbanding PSAC yang hanya mampu menjerap dalam 8 minit pertama sebelum mencapai tahap tepu dan dapat disimpulkan bahawa penjerapan NO adalah lebih efisien menggunakan CSAC berbanding PSAC. Persamaan yang dibentuk melalui Statgraphic menunjukkan hubungan di antara peratusan kecekapan dan kadar alir adalah berkadar songsang.