

Thesis Title Production of Activated Carbon from
 Palm Oil-Shell : Activated by
 Superheated Steam

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Degree Master of Science (Appropriate Technology
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Date of Graduation 21 May B.E.2540 (1997)

Abstract

Thailand is facing the problem of shortage of raw material. One way to solve this problem is to use some kinds of wastes as raw material. This method can not only reduce waste problem, but can also use raw material at maximum usefulness.

The purpose of this study was to produce activated carbon from palm oil shell which is the waste material from palm oil production. The carbonized palm shell was activated by superheated steam. Different samples were created by varying the creation process. The created by the optimum process was tested for chemical and physical characteristics and color adsorption

efficiency. The advantage of using palm shell as raw material for producing activated carbon is useful for the reduction of wasted palm shell and the reduction of importing activated carbon. The processes of carbonization and activation with superheated steam were studied. Some of the characteristics of palm oil shell were found to be: moisture 11.87 %, ash 2.20 %, volatile carbon matters 69.87 %, fixed carbon 16.06 %, total surface area $12.20 \text{ m}^2/\text{g}$, meso pore area $12.20 \text{ m}^2/\text{g}$ and micro pore area $0.00 \text{ m}^2/\text{g}$. The palm oil shell was carbonized at 400°C for 1 hr. The resulting palm oil shell charcoal characteristics were yield(YC) 31.50 %, ash 6.24 %, volatile carbon matters 27.76 %, and fixed carbon 64.48 %. The sample of charcoal was activated with superheated steam. The optimum condition of activation was the activation of 900°C for 1 hour. The resulting characteristics were ash 5.49 %, bulk density 0.45 g/cm^3 , iodine adsorption number 326.24 mg/g, methylene blue adsorption 10.54 mg/g, total surface area $378.1 \text{ m}^2/\text{g}$, meso pore area $94.25 \text{ m}^2/\text{g}$, micro pore area $283.9 \text{ m}^2/\text{g}$ and yield (Y) 24.60 %. At temperature of 900°C for 1 hr. the best charcoal size which is activated by superheated steam is 0.850-0.355 mm the characteristics are yield 19.31 %, bulk density 0.53 g/cm^3 , iodine adsorption number 779.0 mg/g, methylene blue adsorption 136.96 mg/g, total surface area $670.1 \text{ m}^2/\text{g}$, meso pore area $67.24 \text{ m}^2/\text{g}$, micro pore area 602.8

m²/g and average pore area 10.11 Å².

The results of color adsorption of using dichromate ion show that the adsorption capacities of activated palm oil shell of two size ranges, 0.850-0.425 and 0.425-0.250 mm are very close. The average adsorption capacities of the two size ranges were 147 ± 0 and 117 ± 6 mg dichromate ion/ g activated carbon at pH of 1 and 2 respectively.

Applying the technique used in this study Thailand could reduce the amount of imported activated carbon and also reduce waste from palm oil processing which would be good for the economy.