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EFFECT OF ACTIVATION BY CARBON DIOXIDE AND SUPERHEATED STEAM ON
PROPERTIES OF ACTIVATED CARBON FROM COCONUT SHELLS

Miss Phawinee Wutthikun

A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Science in Petrochemistry and Polymer Science

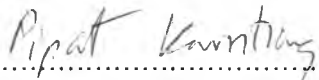
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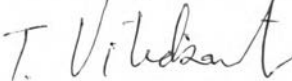
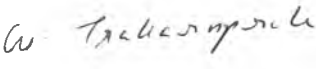
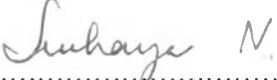
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งานวิจัยนี้เป็นการศึกษาผลกระทบของการกระบวนการกระตุ้นด้วยคาร์บอนไดออกไซด์และไอน้ำร้อนยวดยิ่งต่อสมบัติของถ่านกัมมันต์จากกะลามะพร้าว ในการวิจัยนี้มีสองขั้นตอน ขั้นตอนแรกเป็นการคาร์บอนไนซ์ในช่วงอุณหภูมิ 300-500 องศาเซลเซียสได้พบว่าที่อุณหภูมิที่เหมาะสมต่อการคาร์บอนไนซ์คือ 400 องศาเซลเซียสเป็นเวลา 60 นาที ขั้นตอนที่สองคือการกระตุ้นด้วยคาร์บอนไดออกไซด์และไอน้ำร้อนยวดยิ่งโดยศึกษาตัวแปรที่ใช้คืออุณหภูมิ เวลา ขนาดอนุภาคของถ่านชาร์ และร้อยละองค์ประกอบ(โดยน้ำหนัก)ของคาร์บอนไดออกไซด์ ภาวะที่เหมาะสมในการกระตุ้นคือ ขนาดอนุภาคของถ่านชาร์ 0.60 - 1.18 มิลลิเมตร กระตุ้นที่อุณหภูมิ 950 องศาเซลเซียสเป็นเวลา 60 นาทีและร้อยละองค์ประกอบ(โดยน้ำหนัก)ของคาร์บอนไดออกไซด์เท่ากับ 0.5 ลิตร/นาที โดยควบคุมอัตราการไหลของไอน้ำร้อนยวดยิ่งและอากาศที่ 10 กรัม/นาที และ 0.005 ลิตร/นาที ตามลำดับ ถ่านกัมมันต์ที่เตรียมได้จากกะลามะพร้าวมีร้อยละผลได้ 31.31 ความหนาแน่นเชิงปริมาตร 0.5648 กรัม/ลูกบาศก์เซนติเมตร ค่าไอโอดีน 999 มิลลิกรัม/กรัม ค่าเมทิลีนบลู 188 มิลลิกรัม/กรัม และพื้นที่ผิวB.E.T. 996 ตารางเมตร/กรัม พบว่า เมื่อองค์ประกอบคาร์บอนไดออกไซด์สูงขึ้นเป็นสาเหตุให้ค่าไอโอดีน ค่าเมทิลีนบลูและพื้นที่ผิวรูพรุนต่ำลง เนื่องมาจากคาร์บอนไดออกไซด์มีบทบาทสำคัญต่อการพัฒนารูพรุนขนาดใหญ่มากกว่าไอน้ำร้อนยวดยิ่ง.

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สาขาวิชาปิโตรเคมีและวิทยาศาสตร์พอลิเมอร์ ลายมือชื่ออาจารย์ที่ปรึกษา.....

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PHAWINEE WUTTIKUN: EFFECT OF ACTIVATION BY CARBON DIOXIDE AND SUPERHEATED STEAM ON PROPERTIES OF ACTIVATED CARBON FROM COCONUT SHELLS. THESIS ADVISOR: ASSOCIATE PROFESSOR THARAPONG VITIDSANT, Ph.D., 106 pp. ISBN 974-03-1171-7

The research was the study of the effect of activation by carbon dioxide and superheated steam on properties of activated carbon from coconut shells. The experiment work included two steps. The first step was carbonization at temperature range of 300-500⁰C. It was found that the optimum condition was 400⁰C for 60 min. The second step was activation by carbon dioxide and superheated steam. The studied variables were temperature, time, char particle size and the composition of carbon dioxide (%by weight). The optimum activation condition for particle size was 0.6 – 1.18 mm. 950⁰C, 60 min, the composition of carbon dioxide (%by weight) was 0.5 l/min by fixing flow rate of superheated steam and air at 10 g/min and 0.005 l/min, respectively. The prepared activated carbon from coconut shells obtained % yield of 31.31, bulk intensity of 0.5648 g/cm³, iodine number of 999 mg/g, methylene blue numbers of 188 mg/g and B.E.T. surface area of 996 m²/g. It was also found that the higher component of carbon dioxide caused lower iodine, methylene blue number and B.E.T surface area, because carbon dioxide played the important role to develop large pore size than superheated steam.

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Field of study Petrochemistry and Polymer Science Advisor's signature.....*T. Vitidsant*.....

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ABBREVIATION

T	:	Temperature ($^{\circ}\text{C}$)
t	:	Time (min)
% Y	:	% Yield
% M	:	% Moisture
% VM	:	% Volatile matter
% FC	:	% Fixed carbon
BD	:	Bulk density (g/cm^3)
IA	:	Iodine number (mg/g)
MB	:	Methylene blue number (mg/g)
$S_{\text{B.E.T}}$:	B.E.T. surface area (m^2/g)
GAC	:	Granular activated carbon
PAC	:	Powder activated carbon