

การผลิตถ่านกัมมันต์จากกะลาปาล์มน้ำมันโดยไพโรไลซิสและการกระตุ้น
ด้วยไอน้ำในเครื่องปฏิกรณ์แบบเบดนิ่ง

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**PRODUCTION OF ACTIVATED CARBON FROM PALM-OIL SHELL
BY PYROLYSIS AND STEAM ACTIVATION IN A FIXED BED REACTOR**



Mr. Terachai Suravattanasakul

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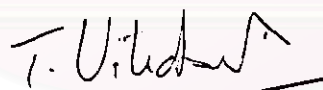
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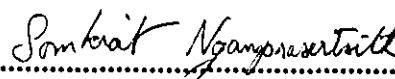
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ธีระชัย สุรวุฒนสกุล : การผลิตถ่านกัมมันต์จากกะลาปาล์มน้ำมันโดยไพโรไลซิสและการกระตุ้นด้วยไอน้ำในเครื่องปฏิกรณ์แบบเบดนิ่ง (PRODUCTION OF ACTIVATED CARBON FROM PALM-OIL SHELL BY PYROLYSIS AND STEAM ACTIVATION IN A FIXED BED REACTOR) อ.ที่ปรึกษา : ผศ.ดร.ธราพงษ์ วิจิตรศานต์, 125 หน้า. ISBN 974-639-471-1.

งานวิจัยนี้มีวัตถุประสงค์เพื่อทดลองผลิตถ่านกัมมันต์จากกะลาปาล์มน้ำมันโดยไพโรไลซิสและการกระตุ้นด้วยไอน้ำในขั้นตอนเดียวในเครื่องปฏิกรณ์แบบเบดนิ่งเส้นผ่านศูนย์กลาง 100 มิลลิเมตร ตัวแปรที่ใช้ศึกษา คือ อุณหภูมิ, เวลา, ขนาดของกะลาปาล์มน้ำมัน และอัตราการไหลของอากาศ จากผลการทดลองพบว่าภาวะที่เหมาะสมในการผลิต คือ ใช้กะลาปาล์มน้ำมันขนาด 1.18-2.38 มิลลิเมตร ที่อุณหภูมิ 750°C เป็นเวลา 2 ชั่วโมง, อัตราการไหลของอากาศ 0.72 nl/min โดยใช้ไอน้ำเป็นสารกระตุ้น ถ่านกัมมันต์ที่ได้มีร้อยละผลิตภัณฑ์ 19.68 %, ความหนาแน่นเชิงปริมาตร 0.5160 g/cm³, ค่าเผ่า 6.03 %, ค่าการดูดซับไอโอดีน 820.16 mg/g, ค่าการดูดซับเมทิลีนบลู 176.75 mg/g และพื้นที่ผิวรพูน 559.48 m²/g

เมื่อเพิ่มเวลาไพโรไลซิสในอากาศ 30 นาที ก่อนการกระตุ้นด้วยไอน้ำ พบว่าการพัฒนาคุณภาพจะเกิดได้มากกว่าไพโรไลซิสและการกระตุ้นด้วยไอน้ำในขั้นตอนเดียว จากผลการทดลองพบว่าภาวะที่มีค่าพื้นที่ผิวรพูนและความสามารถในการดูดซับสูงที่สุด คือ ใช้กะลาปาล์มน้ำมันขนาด 1.18-2.38 มิลลิเมตร หนัก 200 กรัม ที่อุณหภูมิ 750°C เป็นเวลา 3 ชั่วโมง โดยเพิ่มเวลาไพโรไลซิสในอากาศ 30 นาที (0.72 nl/min) ก่อนการกระตุ้นด้วยไอน้ำ ถ่านกัมมันต์ที่ได้มีร้อยละผลิตภัณฑ์ 12.18 %, ความหนาแน่นเชิงปริมาตร 0.5048 g/cm³, ค่าเผ่า 7.54 %, ค่าการดูดซับไอโอดีน 766.99 mg/g, ค่าการดูดซับเมทิลีนบลู 189.20 mg/g และพื้นที่ผิวรพูน 669.75 m²/g

สถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย

ภาควิชา
สาขาวิชา
ปีการศึกษา

ลายมือชื่อนิสิต
ลายมือชื่ออาจารย์ที่ปรึกษา
ลายมือชื่ออาจารย์ที่ปรึกษาร่วม

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TERACHAI SURAVATTANASAKUL : PRODUCTION OF ACTIVATED CARBON FROM PALM-OIL SHELL BY PYROLYSIS AND STEAM ACTIVATION IN A FIXED BED REACTOR. THESIS ADVISOR : ASSIST. PROF. THARAPONG VITIDSANT, Ph.D. 125 pp. ISBN 974-639-471-1.

The research objective was to produce activated carbon from palm-oil shells by one step pyrolysis and steam activation in a fixed bed reactor with the diameter of 100 mm. The studied variables were temperatures, times, palm-oil shells sizes and flow rates of air. The results showed that the optimum condition was 1.18-2.36 mm of palm-oil shells at 750°C for 2 hr with air flow rate of 0.72 nl/min, using steam as an activating agent. The characteristics of the resulted activated carbon with the yield of 19.66 % were bulk density of 0.5160 g/cm³, 6.03 % ash, iodine number of 620.16 mg/g, methylene blue number of 176.75 mg/g and 559.48 m²/g B.E.T. surface area.

In addition, it had been found that when there was an adding of pyrolysis time with air before steam activation led to higher porosity development than one step pyrolysis and steam activation. From these experimental data, it was observed that the maximum surface area and adsorption capacity could be obtained from using 200 g of 1.18-2.36 mm of palm-oil shells at 750°C for 3 hr by adding pyrolysis with air for 30 min (0.72 nl/min) before steam activation. The resulting characteristics of the final product with the yield of 12.18 % were bulk density of 0.5048 g/cm³, 7.54 % ash, iodine number of 766.99 mg/g, methylene blue number of 189.20 mg/g and 669.75 m²/g B.E.T. surface area.

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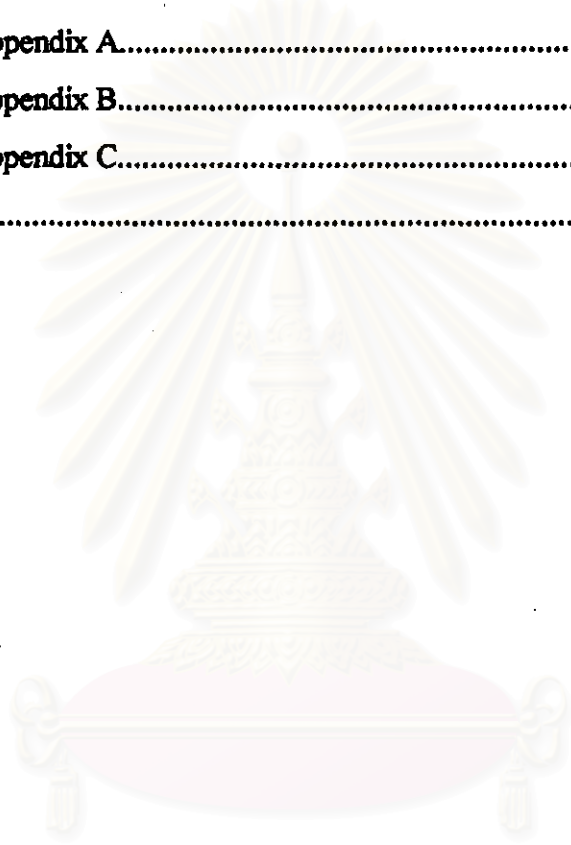
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ABBREVIATIONS

T	:	Temperature (°C)
t	:	Time (hr)
% Y	:	% Yield
% M	:	% Moisture
% VM	:	% Volatile matter
% FC	:	% Fixed carbon
BD	:	Bulk density (g/cm³)
IA	:	Iodine number (mg/g)
MB	:	Methylene blue number (mg/g)
S_{B.E.T.}	:	B.E.T. surface area (m²/g)
S_{micro}	:	Micropore area (m²/g)
S_{external}	:	External surface area (m²/g)
S_{Langmuir}	:	Langmuir surface area (m²/g)
V_{total}	:	Total pore volume (cm³/g)
V_{micro}	:	Micropore volume (cm³/g)
V_{non-micro}	:	Non-micropore volume (cm³/g)

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