

การเปลี่ยนน้ำมันหล่อลื่นใช้แล้วให้เป็นเชื้อเพลิงเหลวบนตัวเร่งปฏิกิริยา
เหล็กบนถ่านกัมมันต์ โคบอลต์และ โมลิบดีนัมบนอะลูมินา และ HZSM-5

นายอำนาจ เพิ่มทรัพย์สกุล

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรดุษฎีบัณฑิต

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คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

ปีการศึกษา 2547

ISBN 974-53-1614-8

ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย

CATALYTIC CONVERSION OF WASTE LUBRICATING OIL
TO LIQUID FUELS OVER Fe/ACTIVATED CARBON,
CoMo/Al₂O₃ AND HZSM-5 CATALYSTS

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A Dissertation Submitted in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy in Chemical Technology

Department of Chemical Technology

Faculty of Science

Chulalongkorn University

Acedemic Year 2004

ISBN 974-53-1614-8

Thesis Title CATALYTIC CONVERSION OF WASTE LUBRICATING OIL
TO LIQUID FUELS OVER Fe/ACTIVATED CARBON,
CoMo/Al₂O₃ AND HZSM-5 CATALYSTS

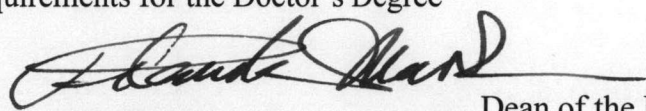
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Field of Study Chemical Technology

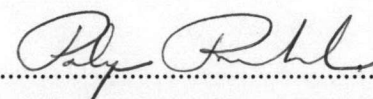
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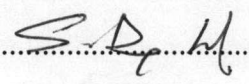
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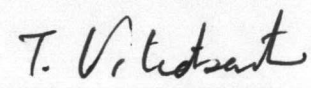
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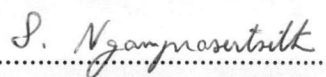
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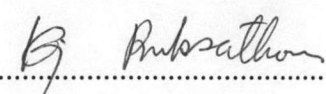

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อำนาจ เพิ่มทรัพย์สกุล : การเปลี่ยนน้ำมันหล่อลื่นใช้แล้วให้เป็นเชื้อเพลิงเหลวบนตัวเร่ง
 ปฏิริยาเหล็กบนถ่านกัมมันต์ โคบอลต์และโมลิบดีนัมบนอะลูมินา และ HZSM-5.
 (CATALYTIC CONVERSION OF WASTE LUBRICATING OIL TO LIQUID FUELS
 OVER Fe/ACTIVATED CARBON, CoMo/Al₂O₃ AND HZSM-5 CATALYSTS)

อ. ที่ปรึกษา ศ.ดร.สมศักดิ์ ดำรงค์เลิศ, อ.ที่ปรึกษาร่วม : รศ.ดร.ธราพงษ์ วิจิตสานต์ 153หน้า.
 ISBN 974-53 -1614-8.

งานวิจัยนี้ได้ทำการศึกษาการเปลี่ยนน้ำมันหล่อลื่นใช้แล้วให้เป็นเชื้อเพลิงเหลวบนตัวเร่งปฏิริยา
 เหล็กบนถ่านกัมมันต์ โคบอลต์และโมลิบดีนัมบนอะลูมินา และ HZSM-5 ด้วยเครื่องปฏิกรณ์ขนาด
 เล็กรูปทรงกระบอก ขนาด 70 มิลลิลิตร ปฏิริยาดำเนินไปภายใต้ความดันเริ่มต้นของแก๊สไฮโดรเจน
 ในช่วง 5 ถึง 10 บาร์ อุณหภูมิระหว่าง 375 ถึง 425 องศาเซลเซียส เวลาของปฏิริยาระหว่าง 10 ถึง 90
 นาที ปริมาณตัวเร่งปฏิริยาเหล็กบนถ่านกัมมันต์และโคบอลต์และ โมลิบดีนัมบนอะลูมินาอยู่ในช่วง
 ร้อยละ 1 ถึง 5 โดยน้ำหนัก และร้อยละ 0.1 ถึง 1 โดยน้ำหนักสำหรับตัวเร่งปฏิริยา HZSM-5 จากผล
 การทดลองพบว่าสัดส่วนการเปลี่ยนของน้ำมันหล่อลื่นใช้แล้วและการแจกแจงผลิตภัณฑ์ที่ได้ขึ้นอยู่กับ
 อุณหภูมิ ปริมาณตัวเร่งปฏิริยาและระยะเวลา เมื่อเพิ่มอุณหภูมิ ปริมาณตัวเร่งปฏิริยาและระยะเวลา
 พบว่าเกิดผลิตภัณฑ์ แก๊สโซลีน เคโรซีน และแก๊สออกัลเบา มีปริมาณเพิ่มขึ้น โดยภาวะที่ให้ร้อยละ
 ผลได้ของแก๊สโซลีนสูงสุดคือ อุณหภูมิ 425 องศาเซลเซียส ความดันเริ่มต้นของแก๊สไฮโดรเจน 5 บาร์
 ระยะเวลา 60 นาที ปริมาณตัวเร่งปฏิริยาเหล็กบนถ่านกัมมันต์และโคบอลต์และ โมลิบดีนัมบนอะลูมินา
 ร้อยละ 5 โดยน้ำหนัก สำหรับ HZSM-5 เป็นร้อยละ 1 โดยน้ำหนัก ผลิตภัณฑ์ที่เป็นของเหลว
 ประกอบไปด้วยพาราฟินสายโซ่ตรงที่มีจำนวนคาร์บอน 7 ถึง 20 อะตอม พาราฟินสายโซ่กิ่งที่มีจำนวน
 คาร์บอน 8 ถึง 10 อะตอม และ สารประกอบแอโรแมติกเช่น โทลูอิน เอทิลเบนซีน และโซลีน
 ระหว่างตัวเร่งปฏิริยาทั้ง 3 ชนิด พบว่าเหล็กบนถ่านกัมมันต์ให้ปริมาณแก๊สโซลีนสูงสุด และมีความ
 จำเพาะเจาะจงสูงต่อการเกิดพาราฟินสายโซ่ตรงที่มีจำนวนคาร์บอน 7 ถึง 15 อะตอม การศึกษาทาง
 จลนพลศาสตร์พบว่า ปฏิริยาการแตกตัวน้ำมันหล่อลื่นใช้แล้วเป็นปฏิริยาอันดับหนึ่ง พลังงานก่อกัม
 มันต์มีค่าอยู่ในช่วง 82.87 ถึง 122.98 กิโลจูลต่อโมล

ภาควิชา เคมีเทคนิค
 สาขาวิชา เคมีเทคนิค
 ปีการศึกษา 2547

ลายมือชื่อนิติ.....
 ลายมือชื่ออาจารย์ที่ปรึกษา.....
 ลายมือชื่ออาจารย์ที่ปรึกษาร่วม.....

4473853523 : MAJOR CHEMICAL TECHNOLOGY

KEY WORD: WASTE LUBRICATING OIL / LIQUID FUELS / Fe-ACTIVATED
CARBON / CoMo/Al₂O₃ / HZSM-5 / CATALYTIC CONVERSION

AMNAT PERMSUBSCUL : THESIS TITLE CATALYTIC CONVERSION
OF WASTE LUBRICATING OIL TO LIQUID FUELS OVER Fe/ACTIVATED
CARBON, CoMo/Al₂O₃ AND HZSM-5 CATALYSTS THESIS ADVISOR:

PROF.SOMSAK DAMRONGLERD, Dr. Ing, THESIS COADVISOR

:ASSOC.PROF.THARAPONG VITIDSANT, Dr. de l'INPT 153 pp. ISBN 974-
53-1614-8.

The catalytic conversion of waste lubricating oil to liquid fuels was studied over iron-loaded activated carbon (Fe/AC), CoMo/Al₂O₃ and HZSM-5 catalysts in a 70-ml. cylindrical micro-reactor. The reaction was run under initial hydrogen pressure range 5 to 10 bar, temperature between 375 °C and 425 °C, reaction time of 10 to 90 minutes, weight percent of Fe/AC and CoMo/Al₂O₃ from 1% to 5% and 0.1% to 1% for HZSM-5. The conversion of waste oil and the product distribution was depended on the reaction temperature, catalyst content and reaction time. Increase in the reaction temperature, amount of catalyst and reaction time increased the formation of gas, gasoline, kerosene and light gas oil. The highest gasoline yield was obtained by operating at temperature of 425 °C, initial hydrogen pressure at 5 bar and reaction time of 60 minutes with 5% by weight of CoMo/Al₂O₃ and Fe/AC and 1% by weight of HZSM-5. The liquid products consisted of C₇-C₂₀ of n-paraffins, C₈-C₁₀ of iso-paraffins and aromatic compounds such as toluene, ethylbenzene and xylene. Among the three catalysts, Fe/AC gave the highest yield of gasoline and highly selective to C₇-C₁₅ paraffin hydrocarbon formation. The kinetic study reveals that the catalytic cracking of waste lubricating oil follows first order. The activation energies have been found of the order of 82.87-122.98 kJ/mol.

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Field of Study Chemical Technology
Academic year 2004

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ACKNOWLEDGEMENTS

The author is very appreciates the kindness of his advisor; Prof. Somsak Damronglerd, co-advisors; Associate Prof. Tharapong Vitidsant for his assistance, care, guidance and constant encouragement. Special gratitude is also expressed to Prof. Pattarapan Prasassarakich, the chairman and Prof. Pramote Chaiyavech, Associate Prof. Somkiat Ngamprasertsith, and Assistant Prof. Kejvalee Pruksathorn, the committee of his presentation.

The author sincerely thanks the Faculty of Science, King Mongkut's Institute of Technology Ladkrabang for providing a scholarship to his to carry out his study at Chulalongkorn University. The author would like to thank the Graduate School, Chulalongkorn University for supporting a research's scholarship to his dissertation. Thank go towards the maintenance section, Bangsue Train Station, Thailand for providing the waste lubricating oil throughout this thesis.

Thank all people who gave generously of their time and talents to help him in many aspects such as the academic discussions and teaching the operation of instruments. They are Mrs. Ratchanee Sae-eng, Miss Naruephat Tangmankongworakoon, Mr. Wichakorn Jarusiri, Mr. Aungsuthorn Mahittikul, Mr. Anawut Katekong, and Mr. Nuntapol Sukmongkol.

Finally, a special thank is conducted to the author's family for their love, inspiration and endless encouragement throughout this entire study.

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