

การสังเคราะห์คอมพอลิเมอร์โพลีบิตา/อะลูมิเนียมเอซเอ็มเอสสำหรับการแตกตัวน้ำมันหล่อลื่น
จาระบี และ พอลิโพรพิลีน

นางสาวกมลวรรณ กิ่งพุทธพงษ์

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
สาขาวิชาปิโตรเคมีและวิทยาศาสตร์พอลิเมอร์
คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย
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SYNTHESIS OF ZEOLITE BETA/Al-HMS COMPOSITE FOR CRACKING OF
LUBRICANT OIL, GREASE AND POLYPROPYLENE

Miss Kamonwan Kingputtapong

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

Faculty of Science

Chulalongkorn University


Academic year 2008

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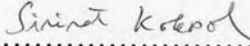
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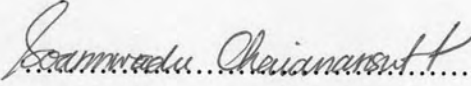
Thesis Title SYNTHESIS OF ZEOLITE BETA/Al-HMS COMPOSITE FOR
 CRACKING OF LUBRICANT OIL, GREASE AND
 POLYPROPYLENE
By Miss Kamonwan Kingputtpong
Field of Study Petrochemistry and Polymer Science
Thesis Advisor Assistant Professor Soamwadee Chaianansutcharit, Ph.D.

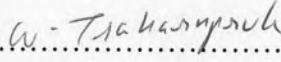
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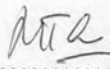

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กมลวรรณ กิ่งพุทธพงษ์: การสังเคราะห์คอมพอสิตซีโอไลต์บีตา/อะลูมิเนียมเอชเอ็มเอส สำหรับการแตกตัวน้ำมันหล่อลื่น จาระบีและพอลิโพรพิลีน. (SYNTHESIS OF ZEOLITE BETA/Al-HMS COMPOSITE FOR CRACKING OF LUBRICANT OIL, GREASE AND POLYPROPYLENE) อ. ที่ปรึกษาวิทยานิพนธ์หลัก: ผศ. ดร. โสภณวี ไชยอนันต์ สุจริต, 106 หน้า

วัสดุคอมพอสิตซีโอไลต์บีตาและอะลูมิเนียมเอชเอ็มเอส ได้ถูกสังเคราะห์โดยวิธีตรงจากซีโอไลต์บีตา เริ่มจากการสังเคราะห์ซีโอไลต์บีตาโดยวิธีไฮโดรเทอร์มัลที่อุณหภูมิ 135 องศาเซลเซียส จากนั้นนำไปตกผลึกร่วมในระหว่างการสังเคราะห์อะลูมิเนียมเอชเอ็มเอส ทำให้ได้ผลิตภัณฑ์ที่เป็นวัสดุคอมพอสิตระหว่างซีโอไลต์บีตาและอะลูมิเนียมเอชเอ็มเอส ทำการศึกษาเปรียบเทียบผลของตัวแปรต่างๆ ได้แก่ เวลาในการตกผลึก และความเข้มข้นของโซเดียมไฮดรอกไซด์ ทำการตรวจสอบตัวอย่างด้วยเทคนิคการเลี้ยวเบนของรังสีเอ็กซ์ กล้องจุลทรรศน์แบบส่องกราด ไอซีพี-เออีเอส อะลูมิเนียมนิวเคลียร์แมกเนติกเรโซแนนซ์ชนิดสปินนัมเฉพาะ การดูดซับและการคายออกของไนโตรเจน ศึกษาการแตกย่อยด้วยตัวเร่งปฏิกิริยาของคอมพอสิตซีโอไลต์บีตาและอะลูมิเนียมเอชเอ็มเอสกับจาระบี น้ำมันหล่อลื่น และพอลิโพรพิลีน ภายใต้ภาวะที่แตกต่างกัน พบว่าภาวะที่เหมาะสมในการแตกย่อยจาระบี น้ำมันหล่อลื่น และพอลิโพรพิลีนในงานวิจัยนี้คือ 400 องศาเซลเซียส 90 นาที 380 องศาเซลเซียส 90 นาที และ 350 องศาเซลเซียส 60 นาที ตามลำดับ ผลิตภัณฑ์ที่เกิดขึ้นได้จากการแตกย่อยของจาระบีและน้ำมันหล่อลื่นมี 1,3 บิวทาไดอินเป็นองค์ประกอบหลัก ในขณะที่การแตกย่อยพอลิโพรพิลีนได้ไอเพนเทนเป็นองค์ประกอบหลักของเหลวที่กลั่นได้จากการแตกย่อยของจาระบี น้ำมันหล่อลื่น และพอลิโพรพิลีนมีองค์ประกอบของไฮโดรคาร์บอนที่มีช่วงจุดเดือดใกล้เคียงกับแกโซลินมาตรฐาน ตัวเร่งปฏิกิริยาของคอมพอสิตที่ใช้ในการแตกย่อยพอลิโพรพิลีนสามารถทำให้กลับคืนสภาพเดิมได้และให้ค่าการเปลี่ยนพลาสติกเป็นผลิตภัณฑ์ได้มากกว่าร้อยละ 90 ซึ่งเป็นค่าที่ยอมรับได้สำหรับการนำกลับมาใช้ใหม่จำนวน 3 ครั้ง

สาขาวิชา ปิโตรเคมีและวิทยาศาสตร์พอลิเมอร์ ลายมือชื่อนิสิต กมลวรรณ กิ่งพุทธพงษ์
ปีการศึกษา 2551 ลายมือชื่อ อ. ที่ปรึกษาวิทยานิพนธ์หลัก โสภณวี ไชยอนันต์

4972204523: MAJOR PETROCHEMISTRY AND POLYMER SCIENCE
 KEYWORDS: CRACKING / COMPOSITE/ ZEOLITE BETA/ Al-HMS/
 LUBRICANT OIL/ GREASE.

KAMONWAN KINGPUTTAPONG: SYNTHESIS OF ZEOLITE BETA/Al-HMS COMPOSITE FOR CRACKING OF LUBRICANT OIL, GREASE. AND POLYPROPYLENE THESIS ADVISOR: ASSIST. PROF. SOAMWADEE CHAIANANSUTCHARIT, Ph.D., 106 pp.

The zeolite beta/Al-HMS composite has been successively synthesized by direct method from crystalline zeolite beta. The zeolite beta was prepared by hydrothermal crystallization at 135°C, and then it was dissolved in base solution, followed by co-crystallization with Al-HMS. The final product was defined as composite material between zeolite beta and Al-HMS. The effects of parameters such as crystallization time and NaOH concentrations were investigated. The composites were characterized by X-ray power diffraction, scanning electron microscope, ICP-AES, ²⁷Al-MAS-NMR and nitrogen adsorption-desorption technique. Catalytic cracking of zeolite beta/Al-HMS composite on grease, lubricant oil and PP were studied in various conditions. The optimal conditions in this study for cracking of grease, lubricant oil and PP were 400°C 90 min, 380°C 90 min and 380°C 60 min, respectively. The major component of gas products obtained by grease and lubricant oil cracking was 1,3-butadiene whereas, i-pentane was the main product for PP cracking. Carbon distribution number of distillate liquid product had boiling point range similar to that of the SUPELCO of standard gasoline. The composite catalyst for PP cracking could be regenerated for 3 cycles and was acceptable due to a high conversion of PP over 90%.

Field of Study: Petrochemistry and Polymer Science Student's Signature Kamonwan Kingputtpong
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ACKNOWLEDGEMENTS

The accomplishment of this thesis can be attributed to the extensive support and assistance from Assistant Professor Dr. Soamwadee Chaianansucharit, my thesis advisor. I would like to sincere gratitude to her for valuable advice and guidance in this research as well as extraordinary experiences throughout the work.

I would like to gratitude to Associate Professor Dr. Sirirat Kokpol, Associate Professor Dr. Wimonrat Trakarnpruk and Assistant Professor Dr. Vanchat Chuenchom as the chairman and member of this thesis committee, respectively, for all of their kindness and useful advice in the research.

I would like to gratefully thank PTT Chemical Public Company Limited for supporting the standard mixtures for GC analysis. Moreover, I would like to thank Department of Chemistry and Program of Petrochemistry and Polymer Science, Faculty of Science, Chulalongkorn University for the valuable knowledge and experience. I would like to thank Thailand Japan Technology Transfer Project for supporting instruments. Furthermore, I would like to thank the members of Materials Chemistry and Catalysis Research Unit for generosity.

Many thanks go in particular to the members of Materials Chemistry and Catalysis Research Unit for their help and encouragement throughout the course of my research and study. Finally, I greatly thank to my family and all of my friends for their help and encouragement during my graduate study.

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LIST OF ABBREVIATIONS

BET	Brunauer-Emmett-Teller method
HMS	Hexagonal Mesoporous Silica
MCM-41	Mobil's Composite of Matters-41
°C	Degree Celsius
GC	Gas Chromatography
g	Gram (s)
h	Hour (s)
ICP	Inductively Coupled Plasma Emission
min	Minute
SEM	Scanning Electron Microscopy
TPD	Temperature-Programmed Desorption
XRD	X-Ray Diffraction