

**STUDY ON USES AND POSSIBILITIES OF QUALITY UPGRADING OF
OIL OBTAINED FROM TIRE PYROLYSIS: CASE OF Pd/H-BETA**



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A Thesis Submitted in Partial Fulfilment of the Requirements
for the Degree of Master of Science
The Petroleum and Petrochemical College, Chulalongkorn University
in Academic Partnership with
The University of Michigan, The University of Oklahoma,
Case Western Reserve University and Institute Français du Pétrole
2008

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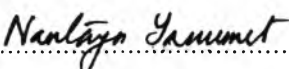
Thesis Title: Study on Uses and Possibilities of Quality Upgrading of Oil
Obtained from Tire Pyrolysis: Case of Pd/H-BETA

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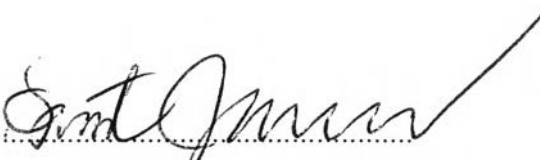
Program: Petrochemical Technology


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Accepted by the Petroleum and Petrochemical College, Chulalongkorn University, in partial fulfilment of the requirements for the Degree of Master of Science.

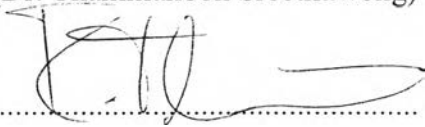

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บทคัดย่อ

เอกรินทร์ ปินธุ: การศึกษาความเป็นไปได้ในการปรับปรุงคุณภาพน้ำมันที่ได้จากการไพโรไลซิสของยางด้วยตัวเร่งปฏิกิริยาแพลลาเดียมบนซีโอไลท์เบตา (Study on Uses and Possibilities of Quality Upgrading of Oil Obtained from Tire Pyrolysis: Case of Pd/H-BETA) อ. ที่ปรึกษา ผศ. ดร. ศิริรัตน์ จิตการคำ และ ดร. สุชาดา บุตรนาค 104 หน้า

การไพโรไลซิสของยางโดยใช้ตัวเร่งปฏิกิริยาแพลลาเดียมบนเบตาซีโอไลท์ ทำปฏิกิริยาในเตาปฏิกรณ์ความดันซึ่งจะแยกออกเป็น 2 ส่วนหลัก ได้แก่ ส่วนล่างเป็นส่วนที่ Yang เกิดการไพโรไลซิส ต่อมาไอของยางที่ได้จากการไพโรไลซิสจะไหลผ่านตัวเร่งปฏิกิริยาทางด้านบนของเตาปฏิกรณ์ ในการวิจัยนี้ได้ศึกษาผลของปริมาณของแพลลาเดียมบนตัวเร่งปฏิกิริยา, อุณหภูมิของส่วนที่บรรจุตัวเร่งปฏิกิริยา, เวลาของไออยู่ในเตาปฏิกรณ์ และผลของวิธีการเตรียมตัวเร่งปฏิกิริยาที่จะมีผลต่อคุณภาพและปริมาณของน้ำมันที่ได้จากการไพโรไลซิส ซึ่งจะพิจารณาจากปริมาณของสารไฮโดรคาร์บอนอิ่มตัวและสารอะโรมาติกส์ในน้ำมัน น้ำมันที่ได้จะทำการวิเคราะห์โดยใช้เครื่องก๊าซโครมาโตกราฟ (SIMDIST-GC) และเทคนิคการแยกสารด้วยโครมาโตกราฟแบบของเหลว ผลปรากฏว่า ตัวเร่งปฏิกิริยาแพลลาเดียมบนเบตาซีโอไลท์สามารถเพิ่มอัตราส่วนของสารไฮโดรคาร์บอนอิ่มตัว และลดปริมาณสารอะโรมาติกส์ในน้ำมันได้ การเปลี่ยนแปลงปริมาณของโลหะบนตัวเร่งปฏิกิริยามีผลต่อน้ำมันในส่วนประกอบทางเคมี และสัดส่วนน้ำมันในด้านปิโตรเลียมต่างๆ นอกจากนี้ยังพบว่า การเพิ่มอุณหภูมิในส่วนบรรจุตัวเร่งปฏิกิริยา และเวลาของไอที่อยู่ในปฏิกรณ์ มีผลทำให้เกิดสารไฮโดรคาร์บอนอิ่มตัวเพิ่มขึ้น สำหรับการไพโรไลซิสที่อุณหภูมิในส่วนบรรจุตัวเร่งปฏิกิริยาค่ำ และใช้เวลาน้อยนั้น มีผลทำให้ช่วยลดปริมาณสารอะโรมาติกส์ในผลิตภัณฑ์ที่เป็นน้ำมันได้ นอกจากนี้พบว่าตัวเร่งปฏิกิริยาที่ได้จากเตรียมด้วยวิธีการทำให้เอิบซุ่ม (Impregnation) มีความสามารถในการลดปริมาณสารอะโรมาติกส์ในน้ำมันมากกว่าตัวเร่งปฏิกิริยาที่เตรียมด้วยวิธีการแลกเปลี่ยนไอออน (Ion-exchange) จากผลการทดลองข้างต้นอาจสรุปได้ว่าสภาวะที่เหมาะสมในการปรับปรุงคุณภาพน้ำมัน ควรใช้ตัวเร่งปฏิกิริยาที่มีปริมาณแพลลาเดียมร้อยละ 0.25 และเตรียมด้วยวิธีเอิบซุ่ม นอกจากนี้เวลา 25 นาที เป็นเวลาที่เหมาะสมที่ไอของยางในเตาปฏิกรณ์ สำหรับอุณหภูมิในส่วนที่บรรจุตัวเร่งปฏิกิริยาควรมีอุณหภูมิต่ำ

ABSTRACT

4971006063: Petrochemical Technology Program

Ekkarin Pintoo: Study on Uses and Possibilities of Quality Upgrading of Oil Obtained from Tire Pyrolysis: Case of Pd/H-BETA

Thesis Advisors: Asst. Prof. Sirirat Jitkarnka and Dr. Suchada Butnark, 104 pp.

Keywords: Tire/Pyrolysis/ Palladium/H-BETA/ Quality Upgrading of Oil

Catalytic pyrolysis of tire over Pd/H-BETA catalyst was carried out using an autoclave reactor separated into two zones; tire was first pyrolyzed in the bottom zone and then, the evolved pyrolysis gases were passed through a catalytic bed on the top zone. The amount of palladium loading, catalytic temperature, residence time, and metal loading method were investigated for their influences on the quality and quantity of oil, represented by the saturated and aromatic hydrocarbons. The pyrolysis oil was characterized using a simulated distillation gas chromatograph (SIMDIST - GC) and liquid chromatography technique. The results indicated that Pd/H-BETA catalyst can produce the higher amount of saturated hydrocarbons and reduce the total aromatics in the oil product. The change of metal loading amount affected on the chemical composition and petroleum fractions in maltene. The saturated hydrocarbons were also increased with the increasing catalytic temperature and residence time. The reduction of total aromatic hydrocarbons can be enhanced at low catalytic temperatures and residence time. Moreover, the impregnated catalysts had higher activity on reducing aromatic hydrocarbons than the ion-exchanged catalysts. Therefore, the optimum conditions for upgrading of pyrolysis oil were the use of 0.25wt% Pd/H-BETA prepared by the impregnated technique, operated at 25 min of residence time, and a low catalytic temperature (350°C).

ACKNOWLEDGEMENTS

This thesis could not be complete without the assistance and support of my advisor, college and my family.

I deeply indebted to Asst. Prof. Sirirat Jitkarnka, my advisor, who provided the intensive attention, useful recommendation, valuable support, and encouragement throughout this work.

I would like to thank Dr. Suchada Butnark for valuable guidance and creative suggestion. Special thanks go to Mr. Nguyen Anh Dung, a Ph.D. student, for his valuable suggestions, comments, and encouragement.

I am grateful for the partial scholarship and partial funding of the thesis work provided by the National Center of Excellence for Petroleum, Petrochemicals, and Advanced Materials, Chulalongkorn University.

Unforgettably, appreciation is forwarded to all staff of The Petroleum and Petrochemical College for helpful in fixing the equipment, valuable suggestions in characterization instruments and other useful help.

Finally, I would like to thank all of my friends and PhD students for their friendly cheerful, creative suggestions and useful assistance. Also, I would like to express the sincerest gratitude to my parents and my brother for their care, love, and infinite encouragement.

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