

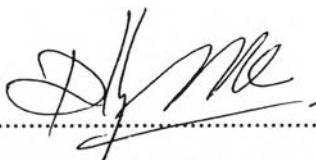
**DEVELOPMENT OF INDUSTRIALIZED Ru/MCM-48 AND Ru/HMOR-
BASED CATALYSTS FOR WASTE TIRE PYROLYSIS**

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A Thesis Submitted in Partial Fulfilment of the Requirements
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The Petroleum and Petrochemical College, Chulalongkorn University
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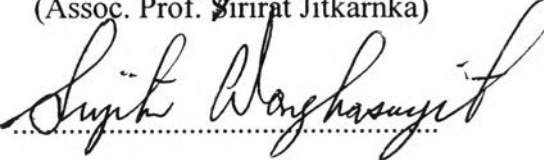
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Program: Petrochemical Technology
Thesis Advisor: Assoc. Prof. Sirirat Jitkarnka
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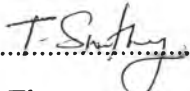
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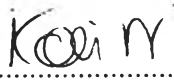

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ABSTRACT

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The demands of light olefins are continuously increased because each of them is one of the Seven Sisters, which are the major raw materials of petrochemical industry. The light olefins can be produced by the oxidative dehydrogenation of alkane, the steam cracking of parafinic hydrocarbon, and the fluid catalytic cracking of heavy oils. This work developed an industrial catalyst of catalytic pyrolysis waste tire for producing light olefins. The industrial catalysts consisted of various combinations of (1) the active component, either Ru/MCM-48 or Ru/HMOR, (2) matrixes such as kaolin, bentonite, montmorillonite, or talcum, and (3) the binder (α -alumina). The study on Ru/MCM-48 based extrudates revealed that the combination; 15% of Ru/MCM-48, 75% of the matrix, and 10% of the binder, was the appropriate composition to produce the highest amount of light olefins. For Ru/HMOR based extrudates, the appropriate composition was 10% of Ru/HMOR, 80% of kaolin, and 10% of α -alumina. The particles of an active component usually generate heat which causes over-cracking. A matrix in the catalyst then helps to spread the heat from the active component in order to prevent over-cracking. In addition, the study of various types of matrix found that bentonite and talc were the best matrixes and heat dissipaters. They help improving the selectivity of light olefins in the gas product.

บทคัดย่อ

ชัยพร วิทย์ปฐมวงศ์ : การพัฒนาตัวเร่งปฏิกิริยาที่นิยมบนวัสดุรูพรุนขนาดกลางเอ็มซีเอ็มซีซีบแปดและรูทีเนียมบนมอร์ดีไนท์ซีโอไลท์เพื่อการอุตสาหกรรมไพโรไลซิสยางหมดสภาพ (Development of Industrialized Ru/MCM-48 and Ru/HMOR-Based Catalyst for Waste Tires Pyrolysis) อ. ที่ปรึกษา : รศ. ดร. ศิริรัตน์ จิตการคำ และ รศ. ดร. สุจิตรา วงศ์เกษมจิตต์ 148 หน้า

ความต้องการของโอเลฟินส์เบาในปัจจุบันเพิ่มขึ้นอย่างต่อเนื่องเพราะว่าเป็น 1 ใน 7 วัตถุประสงค์หลักของอุตสาหกรรมปิโตรเคมี งานวิจัยชิ้นนี้เป็นการพัฒนาตัวเร่งปฏิกิริยาอุตสาหกรรมในการไพโรไลซิสยางหมดสภาพเพื่อผลิตโอเลฟินส์เบา ตัวเร่งปฏิกิริยาสำหรับใช้ในอุตสาหกรรมมักจะประกอบไปด้วย (1) ตัวรองรับ ซึ่งในงานวิจัยนี้ได้แก่ โลหะรูทีเนียมบนตัวรองรับสองชนิดคือ วัสดุที่มีรูพรุนขนาดกลางที่เรียกว่าเอ็มซีเอ็มซีบแปดหรือมอร์ดีไนท์ซีโอไลท์ (2) ตัวเมทริกซ์ ซึ่งได้แก่ ดินเผาลิน, ดินเบนโทไนท์, ดินมอนมอริลโลไนท์ และ ดินแคลคัม และ (3) ตัวประสาน ได้แก่ แอลฟาอลูมินา จากการศึกษาเพื่อหาส่วนประกอบที่เหมาะสมของตัวเร่งปฏิกิริยาละหะรูทีเนียมบนตัวรองรับวัสดุรูพรุนขนาดกลาง เอ็มซีเอ็มซีบแปดพบว่า 15% ของรูทีเนียมบนวัสดุรูพรุนขนาดกลาง เอ็มซีเอ็มซีบแปด, 75% ของตัวเมทริกซ์, และ 10% ของตัวประสาน เป็นส่วนผสมที่เหมาะสมในการผลิตโอเลฟินส์เบาได้มากที่สุด สำหรับโลหะรูทีเนียมบนตัวรองรับมอร์ดีไนท์ซีโอไลท์ ส่วนประกอบที่เหมาะสมคือ 10% ของรูทีเนียมบนมอร์ดีไนท์ซีโอไลท์, 80% ของตัวเมทริกซ์, และ 10% ของตัวประสาน ตัวรองรับในตัวเร่งปฏิกิริยาจะช่วยกระจายความร้อนที่เกิดขึ้นในปฏิกิริยาจากตัวรองรับ ทำให้ไม่เกิดจากแตกตัวต่อ และจากการศึกษาหาประเภทของตัวเมทริกซ์ที่เหมาะสมได้พบว่าดินเบนโทไนท์และดินแคลคัมเป็นตัวเมทริกซ์ที่เหมาะสมและที่สุด การที่มีตัวเมทริกซ์ที่เหมาะสมจะช่วยทำให้เพิ่มการเลือกสรรต่อการเกิดโอเลฟินส์เบาในผลิตภัณฑ์แก๊ส

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