

**DEVELOPMENT OF INDUSTRIALLIZED Pd/BETA BASED CATALYST
FOR WASTE TIRE PYROLYSIS**




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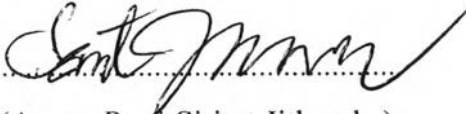
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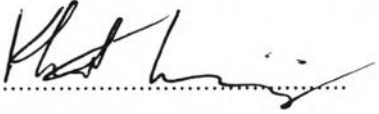
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ABSTRACT

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Keywords: Pyrolysis/ Waste Tires/ Naphtha/ Palladium/ BETA/ Bifunctional Catalysts/ Matrix

Catalytic waste tires pyrolysis is one alternative that has received a great deal of attention in handling many kinds of waste materials such as plastic and tires. In a previous work, 0.25 wt % of palladium supported on beta zeolite has been proven to be the best catalyst in producing naphtha range hydrocarbons. In this research, further investigation on two different Si/Al ratios of beta zeolite support and two different kinds of natural clay matrixes were studied. The agglomerated catalysts composed of various percentages of active component (5, 20, and 40 wt %) in the presence of alumina binder (10 wt %) and a matrix were investigated to find the one that gave the optimum naphtha yields at a high content in the oil obtained from the catalytic pyrolysis of waste tire. According to the results, it was found that each clay matrix itself was not catalytically inactive as it helped reduce the heavy hydrocarbon content and enhanced the production of light oil fraction. The best agglomerated catalyst composition for the naphtha production, which provided the highest concentration of naphtha in the oil product, was found to be 20 wt. % of active Pd/Beta zeolite (Si/Al = 250), 70 wt. % of bentonite, and 10 wt% of α -alumina. Moreover, this agglomerated catalyst composition also gave the maximum yield of the overall naphtha produced from catalytic waste tire pyrolysis. The synergistic effect between the mild cracking activity of the matrix and the cracking activity of active component is the cause of this high naphtha selectivity.

บทคัดย่อ

พิธีฐ อัครพัฒนากุล: การพัฒนาตัวเร่งปฏิกิริยาพลาเดียมบนเบต้าซีโอไลต์เพื่ออุตสาหกรรม (Development of Industrialized Pd/Beta based Catalysts for Waste Tire Pyrolysis) อ. ที่ปรึกษา รศ. ดร. ศิริรัตน์ จิตการคำ 111 หน้า

กระบวนการไพโรไลซิสโดยใช้ตัวเร่งปฏิกิริยา เป็นทางเลือกหนึ่งที่มีความสนใจเป็นอย่างมากเพื่อใช้จัดการกับวัสดุเหลือทิ้ง เช่น ขยะพลาสติกและยางหมดสภาพ ในงานวิจัยที่ผ่านมาชิ้นหนึ่งพบว่า 0.25 wt.% พลาเดียมบนเบต้าซีโอไลต์เป็นตัวเร่งปฏิกิริยาที่ดีที่สุดในการผลิตผลิตภัณฑ์ไฮโดรคาร์บอนในช่วงเนฟทา ในงานวิจัยนี้ได้นำตัวเร่งปฏิกิริยานี้มาศึกษาต่อโดยใช้เบต้าซีโอไลต์ที่มีอัตราส่วนของซิลิกาต่ออะลูมินาที่ต่างกันสองชนิด และใช้ดินธรรมชาติที่ต่างกันอีกสองชนิดเป็นเมทริกซ์ของตัวเร่งปฏิกิริยาดังกล่าว โดยมีจุดประสงค์เพื่อหาองค์ประกอบของตัวเร่งปฏิกิริยาที่ดีที่สุด ที่ให้ความเข้มข้นและปริมาณของเนฟทาในน้ำมันที่ได้จากกระบวนการไพโรไลซิสของยางหมดสภาพสูงสุด จึงได้ทดลองเปลี่ยนแปลงปริมาณของตัวเร่งปฏิกิริยาที่เป็นตัวรองรับจากร้อยละ 5, 20 และ 40 โดยน้ำหนักโดยมีองค์ประกอบของตัวประสานคองที่ร้อยละ 10 ที่เหลือเป็นตัวรองรับ จากผลการทดลองพบว่า ดินธรรมชาติเพียงอย่างเดียวก็มีส่วนร่วมในการทำปฏิกิริยา เนื่องจากมันสามารถช่วยลดปริมาณของไฮโดรคาร์บอนหนักและเพิ่มปริมาณของไฮโดรคาร์บอนเบาในน้ำมันได้ ตัวเร่งปฏิกิริยาที่มีอัตราส่วนของพลาเดียมบนเบต้าซีโอไลต์ซึ่งมีส่วนประกอบของซิลิกาต่ออะลูมินาเท่ากับ 250 ร้อยละ 20 ในตัวเมทริกซ์ที่เป็นดินชนิดเบนโทไนท์ปริมาณร้อยละ 70 และอัลฟาอะลูมินาร้อยละ 10 นั้น สามารถเพิ่มความเข้มข้นของเนฟทาในน้ำมันได้มากที่สุด นอกจากนี้ยังพบว่า องค์ประกอบของตัวเร่งปฏิกิริยาที่อัตราส่วนดังกล่าวสามารถให้ปริมาณการผลิตเนฟทามากที่สุดอีกด้วย จากผลการทดลอง มีความเป็นไปได้ว่าตัวเมทริกซ์ที่ใช้ นั้นมีความเป็นกรดอ่อนซึ่งสามารถช่วยเสริมความสามารถในการแตกตัวของตัวรองรับได้

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