

CONVERSION OF LIGHT NAPHTHA TO PROPYLENE

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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 Institut Français du Pétrole
2005
ISBN 974-9651-97-9

I 222 434 71

Thesis Title: Conversion of Light Naphtha to Propylene
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Program: Petrochemical Technology
Thesis Advisors: Asst. Prof. Boonyarach Kitiyanan

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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มงคล พูนเสถียรทรัพย์ : การผลิตโพรพิลีนจากแนฟทาเบา (Conversion of Light Naphtha to Propylene) อ. ที่ปรึกษา : ผศ. ดร. บุนยรัชต์ กิตยานันท์ 123 หน้า ISBN 974-9651-97-9

แนฟทาเบา โดยเฉพาะ ซี4 ซี5 และ ซี6 ไฮโดรคาร์บอน เป็นผลิตภัณฑ์พลอยได้จาก สตรีมแตกเกอร์ยูนิท แนฟทาเบา สามารถทำปฏิกิริยาแตกตัวต่อเนื่องเป็น โอลิฟินเบา เช่น เอททิลีน และ โพรพิลีน ในอนาคตอันใกล้ความต้องการของโพรพิลีนคาดว่าจะมีมากกว่าเอททิลีน ส่งผลให้ราคาของโพรพิลีนเพิ่มสูงขึ้น ซีโอไลต์ชนิด ซีเอสเอ็มไฟว์ (ZSM-5) ซึ่งนิยมใช้ในอุตสาหกรรมโรงกลั่นถูกพบว่ามีส่วนช่วยเพิ่มผลผลิตของโพรพิลีน ดังนั้น ในงานวิจัยนี้จึงศึกษาการผลิตโพรพิลีน จากแนฟทาเบาโดยใช้ ซีเอสเอ็มไฟว์ ซึ่งมี ซิลิกาต่ออลูมินา ต่างๆกันเป็นตัวเร่งปฏิกิริยา โดยใช้อุณหภูมิในการทำปฏิกิริยาคั้งแต่ 500 ถึง 700 องศาเซลเซียส การแตกตัวโดยความร้อนถูกพบที่ 600 องศาเซลเซียส และยังมีอิทธิพลมากขึ้นเมื่ออุณหภูมิสูงกว่านี้ ตัวเร่งปฏิกิริยาที่มีซิลิกาต่ออลูมินาค่าจะให้ผลผลิตของโพรพิลีนมากกว่า โดยผลผลิตมากที่สุด เมื่อใช้ ซี4 เป็นสารตั้งต้นคือ 35 เปอร์เซ็นต์โดยน้ำหนักที่อุณหภูมิ 550 องศาเซลเซียส และมีค่า 30 เปอร์เซ็นต์โดยน้ำหนักที่อุณหภูมิ 650 องศาเซลเซียส เมื่อใช้ ซี5 เป็นสารตั้งต้น และมีค่า 30 เปอร์เซ็นต์โดยน้ำหนักที่อุณหภูมิ 650 องศาเซลเซียส เมื่อใช้ ซี6 ในทางตรงกันข้าม ตัวเร่งปฏิกิริยาที่มีซิลิกาต่ออลูมินาสูงจะมีเสถียรภาพสูงกว่าและให้อายุการใช้งานนานกว่า โดยระยะเวลาใช้งานนานที่สุดของตัวเร่งปฏิกิริยาที่ให้โพรพิลีนมากที่สุดคือ 24 ชั่วโมง และมีอายุการใช้งาน 75 ชั่วโมงสำหรับตัวเร่งปฏิกิริยาที่ให้โพรพิลีนน้อยที่สุด

ABSTRACT

4671010063: Petrochemical Technology Program
Mongkol Poonsateansup: Conversion of Light Naphtha to
Propylene
Thesis Advisors: Asst. Prof. Boonyarach Kitiyanan, 123 p. ISBN
974-9651-97-9

Keywords: ZSM-5/ Propylene/ Light naphtha/ Catalytic cracking

Light naphtha (mixed C₄, C₅ and C₆) is a by-product from the naphtha steam cracking process. The light naphtha can be further cracked to light olefins, i.e. ethylene and propylene. Demand for propylene has been forecasted to grow faster than ethylene's. In refinery operations, ZSM-5 zeolite catalyst is known to have high selectivity towards propylene in the FCC unit. Therefore, this work focused on using ZSM-5 catalysts with varying Si/Al ratios for cracking light naphtha to propylene at reaction temperatures of 500-700°C. At 650°C, thermal cracking was observed and played a more important role at higher temperature. Lower Si/Al ratio resulted in higher yields of propylene. The maximum yield of propylene for mixed C₄ cracking was about 35 wt% at 550°C, about 30 wt% for mixed C₅ at 650°C and about 30 wt% for mixed C₆ at 650°C. In contrast, the higher Si/Al ratio zeolite had better stability and longer catalyst life. The maximum time on stream was found to be about 24 hours when using maximum yield catalysts and about 75 hours for the lowest yield catalysts.

*

ACKNOWLEDGEMENTS

This work has been a very invaluable experience. This work would not have been succeeded without assistance of many persons and organization.

First of all, I would like to express my sincere thanks to my advisor, Asst. Prof. Boonyarach Kitiyanan for giving me the useful recommendations, invaluable guidance, and constant encouragement throughout this work.

I would like to express my appreciation to Assoc. Prof. Vissanu Meeyoo and Dr. Siriporn Jongpatiwut, who always provide me many valuable advice, suggestion and knowledge.

I also greatly appreciate Dr. Nakarin Mongkolsiri and the people from Rayong Olefins Co., Ltd. not only for the thesis funding, but also for their excellent guidance and assistance. They also made this thesis fascinating.

I am grateful for the partial scholarship and partial funding of the thesis work provided by Postgraduate Education and Research Programs in Petroleum and Petrochemical Technology (PPT Consortium).

Unforgettable, appreciation is forwarded to all staff of The Petroleum and Petrochemical College and my friends for warm support, friendly help and cheerfulness throughout this research work.

Finally, I would like to extend the most important thank to my lovely family for providing me their love, encouragement and measureless support.

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