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DEPOLYMERIZATION OF USED POLYETHYLENE TO HYDROCARBONS
USING DUAL CATALYSTS

Miss Pasaraporn Limim

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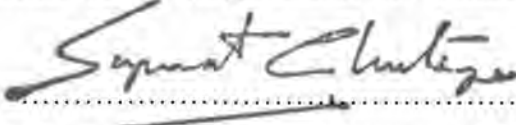
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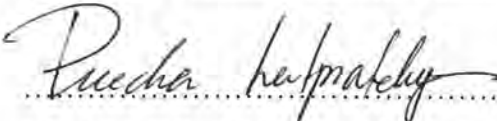

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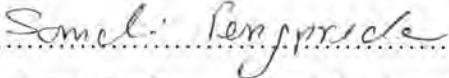
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พัชรภรณ์ ลิ้มอิม : ดีพอลิเมอไรเซชันของพอลิเอทิลีนที่ใช้แล้วเป็นไฮโดรคาร์บอนโดยใช้ตัวเร่งปฏิกิริยา
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งานวิจัยนี้เป็นการศึกษาปฏิกิริยาการแตกตัวด้วยไฮโดรเจนของโพลีเอทิลีนที่ใช้แล้ว เป็นไฮโดรคาร์บอน
เหลว ตัวเร่งปฏิกิริยาที่ใช้ประกอบด้วย 5-10 เปอร์เซ็นต์โดยน้ำหนักของธาตุเหล็ก โคบอลต์ นิเกิล 2.5-5 เปอร์เซ็นต์โดย
น้ำหนักของดีบุก และ 1-2 เปอร์เซ็นต์โดยน้ำหนักของฟลูออไรด์ กระจายตัวบนโมเลกุลคาร์บอนที่มีขนาดรูพรุนต่างกัน ซึ่ง
การศึกษานี้ปฏิกิริยาดีพอลิเมอไรเซชันของพอลิเอทิลีนที่ใช้แล้วกระทำโดยการแปรค่าปริมาณตัวเร่งปฏิกิริยาในช่วง
20-40 เปอร์เซ็นต์โดยน้ำหนัก อุณหภูมิ 350-390 องศาเซลเซียส ภายใต้ความดันของก๊าซไฮโดรเจนในช่วง 400-600
ปอนด์ต่อตารางนิ้ว และเวลาในช่วง 0.5-4 ชั่วโมง พบว่าตัวเร่งปฏิกิริยาและภาวะที่เหมาะสมคือ นิเกิล 10 เปอร์เซ็นต์
ดีบุก 5 เปอร์เซ็นต์ ฟลูออไรด์ 2 เปอร์เซ็นต์ บนโมเลกุลคาร์บอนชนิด 4A-DG ในปริมาณ 40 เปอร์เซ็นต์โดยน้ำหนัก ที่
อุณหภูมิ 390 องศาเซลเซียส ความดัน 500 ปอนด์ต่อตารางนิ้ว ในเวลา 4 ชั่วโมง ได้สารประกอบไฮโดรคาร์บอนเหลว
84.0 เปอร์เซ็นต์โดยน้ำหนัก มีจำนวนคาร์บอนอยู่ในช่วง 8-20 อะตอม และพบว่าขนาดรูพรุนของ โมเลกุลคาร์บอนที่ต่าง
กันไม่มีผลต่อการกระจายตัวของมวลโมเลกุลของสารผลิตภัณฑ์ที่เกิดขึ้น

ภาควิชา.....
สาขาวิชา.....
ปีการศึกษา.....

ลายมือชื่อนิสิต.....
ลายมือชื่ออาจารย์ที่ปรึกษา.....
ลายมือชื่ออาจารย์ที่ปรึกษาร่วม.....

3971197323 : MAJOR PETROCHEMISTRY AND POLYMER SCIENCE

KEY WORD:

CRACKING OF POLYETHYLENE / HYDROCRACKING CATALYST / CATALYST PREPARATION

PASARAPORN LIMIM : DEPOLYMERIZATION OF USED POLYETHYLENE TO HYDROCARBONS USING DUAL CATALYSTS. THESIS ADVISOR : ASSO. PROF. SOPHON ROENGSUMRAN, Ph.D. 117 pp. ISBN 974-332-233-7.

Hydrocracking of used polyethylene to liquid hydrocarbons was studied. The catalyst consisted of 5-10%wt of iron, cobalt and nickel, 2.5-5%wt of tin and 1-2%wt of fluoride on the various pore sizes of molecular sieve. The used polyethylene was depolymerized by varying the catalyst in amounts of 20-40%wt, temperature (350-390 °C), hydrogen pressure (400-600 psig) for 0.5-4 hours. The optimum conditions were at 390 °C, 500 psig for 4 hours using 40%wt of Ni(10%)-Sn(5%)-F(2%) on molecular sieve (4A-DG type) catalyst. The yield of oil product was 84.0%wt, and it consisted of C₈-C₂₀ hydrocarbons. The pore size of the molecular sieve did not influence the molecular weight distribution of the products.

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ABBREVIATIONS

GC	=	Gas chromatography
HDPE	=	High density polyethylene
HMW	=	High molecular weight
LDPE	=	Low density polyethylene
LLDPE	=	Linear low density polyethylene
MEK	=	Methyl ethyl ketone
MS	=	Molecular sieve
MWD	=	Molecular weight distribution
PE	=	Polyethylene
PP	=	Polypropylene
PS	=	Polystyrene
PVC	=	Polyvinyl chloride
UHMW	=	Ultra high molecular weight
ULDPE	=	Ultra low density polyethylene