

ตัวเร่งปฏิกิริยาไทเทเนียมบนตัวรองรับพอลิเมอร์สำหรับพอลิเมอโรเซชันของสไตรีน



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จุฬาลงกรณ์มหาวิทยาลัย

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POLYMER-SUPPORTED TITANOCENE CATALYST FOR STYRENE POLYMERIZATION



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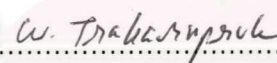
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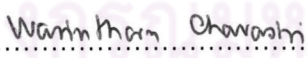
  
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งานวิจัยนี้ได้ศึกษาตัวเร่งปฏิกิริยาไทเทเนียมบนตัวรองรับพอลิเมอร์สำหรับพอลิเมโร  
เซชันของสไตรีน ตัวเร่งปฏิกิริยาไทเทเนียมบนตัวรองรับพอลิเมอร์สามารถแบ่งออกเป็น 2 ระบบ  
ตามชนิดของตัวเร่งปฏิกิริยาร่วม (เมทิลอะลูมิเนียมออกเซน และ สารประกอบโบรอน) ผลการทดลอง  
แสดงว่าระบบซึ่งประกอบด้วยตัวรองรับพอลิเมอร์ (polystyrene-co-DVB) – เพนทาเมทิลไซโคล  
เพนทาไดอีนิลไทเทเนียมไตรคลอไรด์ ( $Cp^*TiCl_3$ ) – เมทิลอะลูมิเนียมออกเซน (MAO) หรือ  
P- $Cp^*TiCl_3$ -MAO ให้แอกติวิตีสูงกว่าระบบซึ่งประกอบด้วยตัวรองรับพอลิเมอร์ (polystyrene-  
co-DVB) – เพนทาเมทิลไซโคลเพนทาไดอีนิลไทเทเนียมไตรคลอไรด์ ( $Cp^*TiCl_3$ ) - ไดเมทิลอะนิล  
เนียมเททราทิส(เพนทาฟลูออโรเฟนิลโบเรต) [ $PhNMe_2H$ ][ $B(C_6F_5)_4$ ] หรือ P- $Cp^*TiCl_3$ -boron  
ภาวะที่เหมาะสมสำหรับระบบ P-  $Cp^*TiCl_3$ -MAO คือ 87 มิลลิโมลของสไตรีน อัตราส่วนโมลของ  
Al/Ti เท่ากับ 300 ใช้ 0.1000 มิลลิโมลของตัวเร่งปฏิกิริยา อุณหภูมิ 70°C และเวลา 4 ชั่วโมง  
ภาวะที่เหมาะสมสำหรับระบบ P- $Cp^*TiCl_3$ -boron คือ 87 มิลลิโมลของสไตรีน อัตราส่วนโมลของ  
Al/Ti เท่ากับ 200 ใช้ 0.0100 มิลลิโมลของตัวเร่งปฏิกิริยา อุณหภูมิ 70°C และเวลา 4 ชั่วโมง  
พอลิสไตรีนที่ได้มีการจัดเรียงตัวของสายโซ่แบบซินดิโอแทคติก ยืนยันจากการพิสูจน์เอกลักษณ์  
ด้วยเทคนิค  $^{13}C$  NMR และผลที่ได้จากเทคนิค SEM แสดงว่าพอลิเมอร์มีลักษณะเป็นไปตามรูป  
ร่างของตัวรองรับ

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

หลักสูตร...ปิโตรเคมีและวิทยาศาสตร์พอลิเมอร์...  
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NIWAT APIPANYASOPON : POLYMER-SUPPORTED  
TITANOCENE CATALYST FOR STYRENE POLYMERIZATION  
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In this thesis, the polymer-supported titanocene catalysts have been studied for styrene polymerization. The polymer-supported titanocene catalysts can be divided into 2 systems according to type of cocatalysts (methylaluminoxane (MAO) and boron compound). The results indicated that (polystyrene-*co*-DVB)-Cp\*TiCl<sub>3</sub>-MAO system or P-Cp\*TiCl<sub>3</sub>-MAO exhibits a higher catalytic activity than (polystyrene-*co*-DVB)-Cp\*TiCl<sub>3</sub>-[PhNMe<sub>2</sub>H][B(C<sub>6</sub>F<sub>5</sub>)<sub>4</sub>] system or P-Cp\*TiCl<sub>3</sub>-boron. The optimum condition for P-Cp\*TiCl<sub>3</sub>-MAO system is: 87 mmol of styrene, Al/Ti molar ratio of 300, 0.1000 mmol of catalyst at polymerization temperature of 70°C and polymerization time of 4 h. The optimum condition for P-Cp\*TiCl<sub>3</sub>-boron system is: 87 mmol of styrene, Al/Ti molar ratio of 200, 0.0100 mmol of catalyst at polymerization temperature of 70°C and polymerization time of 4 h. Tacticity of obtained polystyrene is syndiotactic polystyrene, revealed by the <sup>13</sup>C NMR technique. The result from SEM demonstrated that the morphology of polystyrene is a replica of support particles.

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## LIST OF ABBREVIATIONS

PS	Polystyrene
APS	Atactic polystyrene
IPS	Isotactic polystyrene
SPS	Syndiotactic polystyrene
MAO	Methylaluminoxane
$T_g$	Glass transition temperature
$T_m$	Melting temperature
TMA, $AlMe_3$	Trimethylaluminium
TIBA, $Al(i-Bu)_3$	Triisobutylaluminium
M	Metal
Me	Methyl
Et	Ethylene
Cp	Cyclopentadienyl
Cp*	Pentamethylcyclopentadienyl
Ind	Indenyl
Flu	Fluorenyl
BenzInd	Benzylindenyl
PhInd	Phenylindenyl
P-	Polymer-supported

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