

**DEHYDROXYLATION OF GLYCEROL TO PROPYLENE GLYCOL OVER
COPPER/ZINC OXIDE-BASED CATALYSTS: EFFECT OF CATALYST
PREPARATION**



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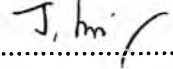
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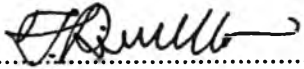
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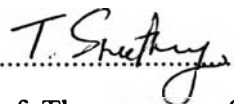
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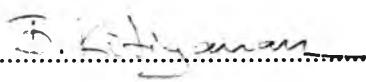
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ABSTRACT

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Issariya Chirddilok: Dehydroxylation of Glycerol to Propylene Glycol over Copper/Zinc Oxide-based Catalyst: Effect of Catalyst Preparation

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Because of the rapid development of biodiesel production by the transesterification of vegetable oil, large quantities of glycerol are available as a reaction by-product. One of the most attractive routes to convert glycerol to high value-added products is the catalytic dehydroxylation of glycerol to propylene glycol. In this study, the catalytic activity of dehydroxylation reaction was investigated over CuZnO/Al₂O₃ catalysts prepared by incipient wetness impregnation at various calcination temperatures. The maximum activity and stability was obtained for the catalyst calcined at 500°C. At the same calcination temperature, the performance of the CuZnO/Al₂O₃ catalysts prepared by co-precipitation was also examined. It was found that the stability of the co-precipitated catalyst was higher than those of the impregnated catalyst. The TEM, TPR, and XRD measurements revealed that a better catalytic performance of the co-precipitated catalyst was assigned to the highly dispersed copper oxide species in spinel-like matrix.

บทคัดย่อ

อิสริยา เจตติลล : การผลิตโพรพิลีนไกลคอลจากกลีเซอรอลโดยตัวเร่งปฏิกิริยาที่มีทองแดงและสังกะสีออกไซด์เป็นส่วนประกอบพื้นฐาน: ผลกระทบของวิธีเตรียมตัวเร่งปฏิกิริยา (Dehydroxylation of Glycerol to Propylene Glycol over Copper/Zinc Oxide-based Catalyst: Effect of Catalyst Preparation) อาจารย์ที่ปรึกษา: ผศ.ดร. ศิริพร จงผาคิวฒิ รศ.ดร. ธีรศักดิ์ ฤกษ์สมบูรณ์ ผศ.ดร. ธรรมบุญ ศรีทะวงศ์ ศ.ดร. สมชาย โอสุวรรณ 71 หน้า

เนื่องจากการผลิตไบโอดีเซลโดยกระบวนการทรานเอสเตอริฟิเคชัน (Transesterification) เพิ่มมากขึ้นทำให้ปริมาณของกลีเซอรอลซึ่งเป็นผลพลอยได้จากปฏิกิริยาเพิ่มมากขึ้นเช่นกัน ดังนั้นการนำกลีเซอรอลไปเปลี่ยนเป็นสารเคมีที่มีมูลค่าสูงขึ้นเช่น โพรเพนไดออลโดยผ่านปฏิกิริยาดีไฮดรอกซิเลชัน (Dehydroxylation) โดยใช้ตัวเร่งปฏิกิริยาถือเป็นทางเลือกหนึ่งที่น่าสนใจ งานวิจัยนี้ได้ศึกษาประสิทธิภาพของตัวเร่งปฏิกิริยาทองแดงและสังกะสีออกไซด์บนอะลูมินา ($\text{CuZnO}/\text{Al}_2\text{O}_3$) ในการทำปฏิกิริยาดีไฮดรอกซิเลชันโดยเตรียมตัวเร่งปฏิกิริยาด้วยวิธีเอ็บซุ่ม (Incipient wetness impregnation) โดยใช้อุณหภูมิในการเผาที่แตกต่างกัน จากการศึกษพบว่า ตัวเร่งปฏิกิริยาที่ใช้อุณหภูมิในการเผาที่ 500 องศาเซลเซียส มีประสิทธิภาพและความเสถียรสูงกว่าเมื่อเทียบกับตัวเร่งปฏิกิริยาที่ใช้อุณหภูมิต่ำอื่น นอกจากนี้ งานวิจัยยังได้ศึกษาประสิทธิภาพของตัวเร่งปฏิกิริยาที่เตรียมโดยผ่านวิธีการตกตะกอนร่วม (Co-precipitation) โดยเผาที่อุณหภูมิ 500 องศาเซลเซียส พบว่า ตัวเร่งปฏิกิริยาที่เตรียมโดยวิธีตกตะกอนร่วมมีประสิทธิภาพและความเสถียรสูงกว่าตัวเร่งปฏิกิริยาที่เตรียมโดยวิธีเอ็บซุ่ม ทั้งนี้เนื่องจากการกระจายตัวของทองแดงออกไซด์ในโครงสร้างสปีเนล ซึ่งวิเคราะห์ได้จากเทคนิค TEM, TPR, และ XRD.

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