

**NEW CATALYSTS FOR SELECTIVE CATALYTIC OXIDATION OF
CARBON MONOXIDE IN THE PRESENCE OF HYDROGEN**

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บทคัดย่อ

อาภาณี เหลืองนฤมิตรชัย : ตัวเร่งปฏิกิริยาชนิดใหม่สำหรับการเลือกเกิดปฏิกิริยาออกซิเดชันของก๊าซคาร์บอนมอนอกไซด์ในบรรยากาศก๊าซไฮโดรเจน (New Catalysts for Selective Catalytic Oxidation of Carbon Monoxide in the Presence of Hydrogen) อ. ที่ปรึกษา : ศ.ดร.เอโดแกน กุลารี่ และ ศ.ดร.สมชาย โอสวรรณ 128 หน้า ISBN 974-9651-02-2

ในงานวิจัยนี้ได้ศึกษาการประยุกต์ใช้ตัวเร่งปฏิกิริยาสำหรับเลือกเกิดปฏิกิริยาออกซิเดชันของก๊าซคาร์บอนมอนอกไซด์ในบรรยากาศก๊าซไฮโดรเจน โดยได้ศึกษาผลของการเตรียมตัวเร่งปฏิกิริยา ความเข้มข้นของก๊าซออกซิเจน ไอน้ำ และก๊าซคาร์บอนไดออกไซด์ในสารตั้งต้นบนตัวเร่งปฏิกิริยาแพลทินัมบนตัวรองรับซีเรีย และทองบนตัวรองรับซีเรีย ที่อุณหภูมิในการทำปฏิกิริยา 50-190 องศาเซลเซียส ในการทดสอบความว่องไวในการทำปฏิกิริยานี้ ใช้ก๊าซซึ่งเป็นสารตั้งต้นประกอบไปด้วยก๊าซคาร์บอนมอนอกไซด์ 1% ก๊าซออกซิเจน 1% ก๊าซคาร์บอนไดออกไซด์ 2% ไอน้ำ 2.6% ก๊าซไฮโดรเจน 40% ในบรรยากาศของก๊าซฮีเลียม พบว่าวิธีการเตรียมแบบโซลเจลทำให้ตัวเร่งปฏิกิริยาแพลทินัมบนตัวรองรับซีเรีย มีความว่องไวสูงที่อุณหภูมิในการทำปฏิกิริยา 100 องศาเซลเซียส ในขณะที่ตัวเร่งปฏิกิริยาทองบนตัวรองรับซีเรียซึ่งเตรียมโดยวิธีการตกตะกอนร่วมมีความว่องไวสูงสุดที่อุณหภูมิในการทำปฏิกิริยา 110 องศาเซลเซียส ส่วนการศึกษาผลกระทบของความเข้มข้นของไอน้ำและก๊าซคาร์บอนไดออกไซด์ในสารตั้งต้นในปริมาณสูง พบว่าก๊าซคาร์บอนไดออกไซด์มีผลในการลดความว่องไวในการทำปฏิกิริยาของตัวเร่งปฏิกิริยาทั้งสอง ในขณะที่ไอน้ำมีผลในทางบวกต่อตัวเร่งปฏิกิริยาแพลทินัมแต่เกือบไม่มีผลเลยต่อตัวเร่งปฏิกิริยาทอง ตัวเร่งปฏิกิริยาแพลทินัมบนตัวรองรับซีเรียซึ่งเตรียมโดยวิธีโซลเจลให้ค่าการเปลี่ยน 85% และการเลือกเกิด 50% ที่อุณหภูมิในการทำปฏิกิริยา 100 องศาเซลเซียส และตัวเร่งปฏิกิริยาทองบนตัวรองรับซีเรียซึ่งเตรียมโดยวิธีตกตะกอนร่วม ให้ค่าการเปลี่ยน 92% และการเลือกเกิด 62% ที่อุณหภูมิในการทำปฏิกิริยา 110 องศาเซลเซียส และความว่องไวของตัวเร่งปฏิกิริยาทั้งสองมีค่าคงที่ตลอดการทดสอบ 48 ชั่วโมง

ABSTRACT

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The catalytic performance of selective CO oxidation catalysts during preferential oxidation of CO in a hydrogen-containing atmosphere was studied. In this work, the effects of preparation method, calcination temperature, oxygen, water vapor, and CO₂ concentration in feed stream over Pt/CeO₂ and Au/CeO₂ catalysts were carried out in the temperature of 50-190°C. The catalytic activity was tested by using the gas mixture of 1% CO, 1% O₂, 2% CO₂, 2.6% H₂O, and 40% H₂ balanced in He. Sol-gel method was found sufficient to initiate a high catalytic activity of the 1%Pt/CeO₂ catalyst at 100°C while the 1%Au/CeO₂ prepared by co-precipitation method exhibited the highest activity at 110°C. High concentrations of H₂O and CO₂ in the feed gas were also investigated in order to observe the adverse effect. The presence of CO₂ decreased the catalytic performance on both catalysts while H₂O had a positive effect on the catalytic activity of Pt catalyst but had no significant effect on the catalytic activity of Au catalyst. The 1%Pt/CeO₂ sol-gel catalyst gave 85% conversion and 50% selectivity at 100°C and the 1%Au/CeO₂ co-precipitation catalyst gave 92% conversion and 62% selectivity at 110°C during a 48 h stability test without any significant drop.

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