

**SELECTIVE CO OXIDATION IN THE PRESENCE OF HYDROGEN
FOR FUEL CELL APPLICATIONS**



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แก้วใจ คำวิไลศักดิ์ : การเลือกเกิดปฏิกิริยาออกซิเดชันของก๊าซคาร์บอนมอนอกไซด์ในบรรยากาศก๊าซไฮโดรเจนสำหรับประยุกต์ใช้ในเซลล์เชื้อเพลิง (Selective CO Oxidation in the Presence of Hydrogen for Fuel Cell Applications) อ. ที่ปรึกษา : ศ.ดร. เอโดแกน กุลารี่ และ ศ.ดร.สมชาย ใสสุวรรณ 66 หน้า ISBN 974-13-0678-4

การศึกษาผลของการใช้ตัวเร่งปฏิกิริยาโลหะแพลเลเดียมบนตัวพวยงซีเรีย แพลเลเดียมบนตัวพวยงเซอร์โคเนีย และแพลเลเดียมบนตัวพวยงผสมระหว่างซีเรียและเซอร์โคเนียต่อความว่องไวของตัวเร่งปฏิกิริยาและการเลือกเกิดปฏิกิริยาออกซิเดชันของก๊าซคาร์บอนมอนอกไซด์ในบรรยากาศก๊าซไฮโดรเจนสำหรับประยุกต์ใช้ในเซลล์เชื้อเพลิง ตัวเร่งปฏิกิริยาในงานวิจัยนี้เตรียมขึ้นโดยใช้วิธีการเตรียมแบบการตกตะกอนร่วม และแบบอิมเพรกเนชันบนโซลเจล ผลการศึกษาด้วยการวัดเอ็กซ์เรย์ดิฟแฟรกชันและการวัดพื้นที่ผิวของตัวเร่งปฏิกิริยาแสดงให้เห็นว่า การเตรียมแบบอิมเพรกเนชันบนโซลเจลให้ความเป็นผลึกและพื้นที่ผิวมากกว่า โดยเฉพาะตัวเร่งปฏิกิริยาโลหะแพลเลเดียมบนตัวพวยงผสมระหว่างซีเรียและเซอร์โคเนีย การวิจัยนี้พบว่าอุณหภูมิที่ใช้ในการแคลไซน์ สัดส่วนของโลหะแพลเลเดียมต่อตัวพวยงซีเรียและเซอร์โคเนีย และวิธีการเตรียมตัวเร่งปฏิกิริยามีผลต่อความว่องไวของตัวเร่งปฏิกิริยา ที่ร้อยละหนึ่งโดยน้ำหนักของโลหะแพลเลเดียมบนตัวพวยงซีเรียที่เตรียมโดยการตกตะกอนร่วมแล้วแคลไซน์ที่ 300 องศาเซลเซียสเป็นเวลาสองชั่วโมงให้ประสิทธิภาพที่สูงที่สุด และจากการทำรีดักชันด้วยไฮโดรเจนของร้อยละ 10 ที่อุณหภูมิ 300 องศาเซลเซียสสามารถเพิ่มความว่องไวได้สูงขึ้น โดยสรุปพบว่าตัวเร่งปฏิกิริยาที่เตรียมโดยการตกตะกอนร่วมให้ประสิทธิภาพที่สูงกว่าตัวเร่งปฏิกิริยาที่เตรียมโดยวิธีอิมเพรกเนชันบนโซลเจล

ABSTRACT

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The catalytic performance of Pd/CeO₂, Pd/ZrO₂, and Pd/CeO₂-ZrO₂ catalysts in selective CO oxidation in the presence of large amounts of hydrogen were investigated for fuel cell applications. Co-precipitation and impregnation on supports prepared by sol-gel methods were used to prepare the catalysts. The results from XRD and BET revealed that the sol-gel catalysts had high crystallinity and surface area especially for Pd on mixed oxide supports. The calcination temperature, ratio of Pd to Ce and Zr loading, and catalyst preparation method had strong effect on catalyst activity. The catalysts prepared by co-precipitation method had higher activity than catalysts prepared by impregnation method. The 1%Pd/CeO₂ co-precipitation catalyst calcined at 300°C for two hours exhibited the highest activity. Pretreatment of the catalyst by reducing with 10% H₂ at 300°C for three hours maximized the activity.

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