

**SELECTIVE HYDROGENATION OF 1-HEXYNE USING
Pd-Ni AND Ni-Mn SUPPORTED ON ALUMINA CATALYSTS**

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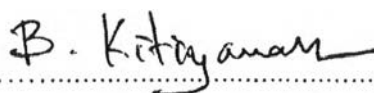
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ABSTRACT

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Vinyl acetylene and 1-butyne are by-products in mixed C₄ separation processes and they must be eliminated due to safety concern. However, C₄ acetylene can be upgraded to higher value hydrocarbons such as 1,3-butadiene and 1-butene by using selective hydrogenation. For hydrogenation catalyst, Pd supported on alumina has been successfully utilized in hydrogenation process. Nevertheless, Pd is still relatively expensive, therefore other transitional metals e.g. Ni is suggested. In this study, 1-hexyne is selected to be a model acetylene compound. The scope of this work is to evaluate the activity and selectivity of 1-hexyne hydrogenation in mild conditions (40 °C, 1.5 bar) using Pd/Al₂O₃ and Ni/Al₂O₃ at different metal loading. Low loaded Ni on alumina exhibited the highest in 1-hexene selectivity improved in the order: 0.3%Ni > 0.3%Pd > 1%Ni ≈ 1.5%Ni ≈ 2%Ni ≈ 3%Ni. Interestingly, Pd-Ni and Ni-Mn bimetallic catalysts at various Pd/Ni and Ni/Mn molar ratios exhibited superior 1-hexene selectivity. PdNi_{2.0}/Al₂O₃ and NiMn_{1.0}/Al₂O₃ bimetallic catalysts provide 1-hexene selectivity 87% and 92% at completed conversion. The catalysts were also characterized by BET, TPR, and H₂-chemisorption.

บทคัดย่อ

กมลลภา ขันแก้ว : ปฏิริยาไฮโดรจีนชันแบบเลือกเกิดของ 1-เฮกไซล์ โดยใช้โลหะแพลเลเดียมและนิกเกิลรวมถึงโลหะผสมแพลเลเดียม-นิกเกิล และ โลหะผสมนิกเกิล-แมงกานีสบนตัวรองรับอะลูมินาเป็นตัวเร่งปฏิริยา (Selective Hydrogenation of 1-Hexyne Using Pd-Ni and Ni-Mn Supported on Alumina Catalysts) อ. ที่ปริภษา : ผศ. ดร. บุนยรัชต์ กิตยานันท์ 46 หน้า

ไวโนวอะเซทิลีนและ 1-บิวไทน์เป็นองค์ประกอบหนึ่งในองค์ประกอบรวมซึ่งไฮโดรคาร์บอน ซึ่งสารประกอบเหล่านี้จะถูกกำจัดโดยการเผาไหม้ แต่อย่างไรก็ตามไวโนวอะเซทิลีนและ 1-บิวไทน์สามารถเปลี่ยนรูปเป็นสารประกอบไฮโดรคาร์บอนที่มีมูลค่าสูงขึ้นได้ เช่น 1,3-บิวตาไดอินและ 1-บิวทีนได้โดยใช้กระบวนการเลือกเกิดปฏิริยาไฮโดรจีนชัน ตัวเร่งปฏิริยาแพลเลเดียมเป็นที่รู้จักและถูกใช้ในปฏิริยาไฮโดรจีนชันอย่างแพร่หลาย แต่เนื่องจากราคาของแพลเลเดียมค่อนข้างสูง จึงมีการเลือกใช้โลหะทรานซิชันอื่นแทน เช่น นิกเกิล เป็นต้น และสำหรับงานวิจัยนี้จะใช้ 1-เฮกไซล์เป็นต้นแบบศึกษาปฏิริยาไฮโดรจีนชันแทนไวโนวอะเซทิลีน จุดประสงค์ของงานวิจัยนี้เน้นศึกษาความว่องไวของปฏิริยาและการเลือกเกิดปฏิริยาของ 1-เฮกซีน โดยใช้ตัวเร่งปฏิริยาแพลเลเดียมและนิกเกิลในปริมาณที่ต่างกันเจือบนตัวรองรับอะลูมินา ซึ่งการเจือนิกเกิลปริมาณน้อยให้ผลการเลือกเกิดปฏิริยาของ 1-เฮกซีนสูงที่สุด และสิ่งที่น่าสนใจมากกว่านั้นคือการเจือโลหะนิกเกิลบนตัวเร่งปฏิริยาแพลเลเดียมบนตัวรองรับอะลูมินาและการเจือโลหะแมงกานีสบนตัวเร่งปฏิริยานิกเกิลบนตัวรองรับอะลูมินา โดยให้ผลการเลือกเกิดปฏิริยาของ 1-เฮกซีนเพิ่มมากยิ่งขึ้น

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