



Title : Reduction and Activation of Ni-based Catalyst on Al₂O₃ Support Under DBD Plasma Condition and CO₂ Methanation Testing

Author(s) :

1. Ms. Wipaporn Jai-eye	Student ID : 650510104
2. Mr. Visawa Phanomai	Student ID : 650510105
3. -	Student ID : -

Major : Industrial Chemistry

Advisor(s) :

1. Assistant Professor Dr. Nongnuch Rueangjitt
2. -
3. -

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ABSTRACT

The research project aims to investigate the characteristics and catalytic activity of nickel-based catalyst supported on alumina (Ni/Al₂O₃) for CO₂ methanation. This study focuses on the effects of nickel loading (10%wt. and 20%wt.) and voltage of Dielectric Barrier Discharge (DBD) plasma (61.5, 115 and 125 V). The prepared catalysts (incipient wetness impregnation) were reduced by hydrogen under the conventional heating and plasma treating conditions. The catalyst characterization was determined using SEM-EDS and BET surface area and pore analyzer. The result indicated that the plasma-treated catalysts significantly better performed than the untreated one. This improvement was attributed to the ability of plasma in enhancing nickel particle dispersion and surface activation of the support, which promoted the adsorption and activation of CO₂ and H₂ molecules. The 10NiR125 catalyst achieved the highest conversion rates for CO₂ and H₂ at 11.78% and 6.39%, respectively. In addition, carbon monoxide (CO) was found to be the primary product. The 10NiRP125 catalyst performed the CO yield of 10.30%.

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