

Research Title: Catalytic Conversion of Glycerol to Alcohols
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ABSTRACT

Glycerol is a low-value by-product from the biodiesel process. The conversion of glycerol to more valuable products is of such interest. In this research, the deoxygenation of glycerol to 1-propanol in sequential bed system was studied. In the upper bed, H-ZSM-5 (Si/Al ratio 12.5) was used as a catalyst for the dehydration of glycerol. From that first system, acrolein is a major product and hydroxyacetone is a minor product with the yield of 80% and 15%, respectively. In the lower bed, 20 wt.% Ni on various supports (Ni/Al₂O₃, Ni/SiO₂, Ni/TiO₂, Ni/LDH, Ni/MgO, and Ni/C) were used for the hydrogenation reaction of acrolein. The results suggest that propionaldehyde is an intermediate which further yield the desired 1-propanol via hydrogenation. Moreover, this compound could also react with water yielding propanoic acid. In addition, the interaction between metal on various supports demonstrates the different catalytic performances. The hydrogenation activities of the catalyst are in the order of: Ni/Al₂O₃ > Ni/TiO₂ > Ni/LDH > Ni/SiO₂ > Ni/MgO > Ni/C. The reaction temperature in the range of 120-200°C is suitable for promoting the acrolein hydrogenation. However, the catalytic deactivation was observed due to the deposition of high molecular product over the catalyst.

Keywords : glycerol, nickel, hydrogenation, 1-propanol