

Jittawat Siwawut 2014: Effect of Quantity, Ratio and Impregnation Sequence on Co-metal Catalysts (Cu, Zn and Al) Supported on SiO₂-TiO₂ for Methanol Production via CO₂ Hydrogenation Reaction. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Associate Professor Paisan Kongkachuichay, Ph.D. 93 pages.

The increasing of atmospheric CO₂ concentration, they are the main cause in Global warming. The greenhouse gas, CO₂ is emitted by the consumption of fossil fuel energy and the decreasing of woodland has persuaded the greenhouse effect and ozone depletion. However CO₂ can be the low-cost carbon source for hydrogenation reaction that converted to methanol. So CO₂ hydrogenation has become interesting research not only it recovers environmental concerns but also it advantage to added value in economical. The effect of quantity, composition and different impregnation sequences on the catalytic properties of Cu-Zn-Al/SiO₂-TiO₂ in the CO₂ hydrogenation reaction was investigated. The Cu-Zn-Al catalysts supported by silica and titania were prepared by incipient wetness impregnation. The catalysts characterizations were identified by characterization tools such as N₂ adsorption-desorption, XRD, XRF, XAS, H₂-TPR, SEM, NH₃-TPD and TGA. The catalysts performance were tested by CO₂ hydrogenation reaction under condition of T= 250°C, P = 15 bars, H₂ : CO₂ = 3:1 (volume ratio) and GHSV = 1800 h⁻¹. The composition variation of Cu and Zn catalysts exhibited a high methanol production for the higher composition Cu catalysts because this catalyst gave the higher copper which was the active site for CO₂ activation. For the metal quantity of catalysts, 10wt% of co metal (Cu-Zn-Al) showed the highest methanol selectivity when compared with 20wt% and 30wt% of co metal as 10wt% of co metal was the highest surface area. The last part, impregnation sequence did not obviously affect to methanol synthesis reaction.

Student's signature

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