Rattanaporn Samanpratan 2013: Development of Catalyst for Conversion Reaction of Acetone to Cumene. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Associate Professor Paisan Kongkachuichay, Ph.D. 103 pages.

The aim of this research is to develop catalysts for conversion reaction of acetone to cumene. The selected catalysts are bimetals of Cu-Zn, Cu-Al, and Cu-Cr and an acid catalyst, Al-MCM-41, which was increased its acidity by exchanging proton with ammonium chloride. Firstly, 20 wt. % of bimetals were loaded on the Al-MCM-41 by an incipient wetness impregnation having the weight ratio of two metals at 1:1. Then, they were used to catalyze the conversion reaction at 200 °C under atmospheric pressure. The results show that the acetone was able to be converted only 24 %, giving cumene yield below 10 %. However, among three pairs of bimetals the Cu-Zn yielded the best performance. To increase the conversion, the way to use the catalysts was modified by separating the bimetals from the Al-MCM-41. All of bimetals were prepared by a co-crystallization technique. They were packed into the reactor in the front zone for catalyzing a hydrogenation reaction of acetone to isopropanol. Then, the Al-MCM-41 was packed in the rear zone for catalyzing an alkylation of isopropanol to cumene. The obtained results show much higher conversion and yield than the first experiment. The Cu-Zn still yielded the best performance. Subsequently, the co-precipitation technique was adopted to prepare the Cu-Zn catalyst. It was found that the obtained catalyst has better elemental distribution, having smaller particle size. When it was used to catalyze the reaction at the same condition as the previous experiment, the results show that the cumene yield was increased from 24 to 39 %, while the acetone conversion was slightly decreased from 85 to 79 %. After conducting the reaction at varied temperature from 200 to 300 °C using the Cu-Zn and Al-MCM-41 catalysts, it was found that at 250 °C the maximum conversion of acetone was achieved. Finally, Cu-Zn having different Cu:Zn ratio was prepared and tested their performance for acetone conversion at 250 °C. The Cu-Zn that has the ratio of 1:1 and 7:3 exhibited the best results; however, based on cost of chemicals the 1:1 Cu-Zn should be selected for this reaction. Conclusively, the optimum condition for the conversion reaction of acetone to cumene is to use Cu-Zn prepared by co-precipitation with molar ratio of 1:1 and Al-MCM-41 as catalysts, carrying the reaction at 250 °C, space velocity 60 h^{-1} under atmospheric pressure. By this condition, acetone can be converted 84 % yielding cumene 36 % and having selectivity of cumene 94 %.

_____ _____ ___ / ___ / ___

Student's signature Thesis Advisor's signature