CHAPTER V

CONCLUSION AND SUGGESTIONS

An alkali free-coprecipitation method has successfully been employed to prepare MgAl and MgGa hydrotalcite materials. The Mg/Al and Mg/Ga molar ratio was chosen to be 4. The as-syn hydrotalcites were calcined and rehydrated. The calcined hydrotalcites were impregnated with group I-II metals in different wt%. The catalysts were characterized by several techniques: XRD, SEM, FTIR, BET and Hammett titration. Upon calcinations, the structure of hydrotalcite was collapsed to MgAlO phase. However, the structure was recovered when rehydration was performed on the calcined materials.

The transesterification of tributyrin (as a model compound of oil) with methanol was studied in order to compare catalytic activity of the prepared catalysts. The results show that the rehydrated hydrotalcites give higher % conversion of tributyrin than the calcined ones. MgAl hydrotalcite is better than MgGa hydrotalcite. However, the calcined hydrotalcites loaded with metal show higher %conversion. Among the group I metals (Li, Na, K), K is the best metal. The activities of heterogeneous base catalysts correlated with their corresponding basic properties. The catalyst with 1.5 wt.%K loading on the calcined hydrotalcite was found to be the optimum catalyst, which gave high basicity and the best catalytic activity. The catalysts in this work show higher activity than the catalyst reported by Cantrell *et al.* [20]

In addition, the transesterification of refined palm oil with methanol was performed using 1.5%K loaded-calcined MgAl hydrotalcite catalyst. A molar ratio of methanol to oil of 45:1 and high amount of catalyst (7.5 wt%) were found to be necessary for obtaining high yield. Attempts to decrease the amount of catalyst resulted in a decrease in product yield and ester content. When the reaction was carried out at high temperature 100°C, higher product yield and ester content were obtained compared to those at 60°C. The reaction time can be shorted when increasing temperature. In reaction time of 9 h, at 100°C, %ester content of 93.7% and

product yield 85.6% were obtained. The catalyst can be regenerated by calcination and reloading K. It was found that %K loaded higher than 1.5%, especially at 4.0%K resulted in metal leaching from the catalyst. This turns the system to be homogeneous catalysis. Soap was formed and made separation of ester difficult.

Suggestions

Hydrotalcite with higher molar ratio of Mg/Al should be tested and compared. In addition, the hydrotalcite loading with other type of metal should be investigated.