

## CHAPTER V

### CONCLUSION

Fe-pillared clays, hectorite and bentonite, can be synthesized by intercalation method followed by calcination at 300°C for 5h. The 1M FeCl<sub>3</sub> is used as a pillaring agent. XRD patterns of the calcined samples show the layered structure with the d<sub>001</sub> spacing in the range of 10-15 Å. For the Fe-pillared clays, with various iron contents, the Si-O band gradually shifts to upper wave number due to the formation of Si-O-Fe. From the results of SEM and elemental mapping, no aggregation of Fe<sub>2</sub>O<sub>3</sub> was observed on the clay surface. The Nitrogen adsorption-desorption isotherm of Fe-pillared clays is shown the distorted reversible type IV isotherm indicating that Fe<sub>2</sub>O<sub>3</sub> in calcined samples converted clay-layered structure to micro-mesoporous structure. Therefore, the BET specific surface areas of Fe-pillared clay were higher than pure clays. The BET specific surface area of Fe-pillared clays depends on iron content. As iron contents in calcined samples are increased, the BET specific surface areas are also increased.

Ga-doped Fe<sub>10</sub>-pillared hectorites can be synthesized by direct intercalation (HFe<sub>10</sub>Ga<sub>1</sub>) and impregnation (HFe<sub>10</sub>Ga<sub>1</sub>I). The d<sub>001</sub> spacing of HFe<sub>10</sub>Ga<sub>1</sub> and HFe<sub>10</sub>Ga<sub>1</sub>I are slightly differ from that of Fe<sub>10</sub>-pillared hectorite (HFe<sub>10</sub>). The characteristic peaks of clay are observed in both Ga-doped Fe<sub>10</sub>-pillared hectorites, indicating that gallium does not affect the clay structure. The BET specific surface area of both Ga-doped Fe<sub>10</sub>-pillared hectorites is still higher than pure hectorite.

All Fe-pillared clays show good catalytic activities for alkylation of benzene with 1-dodecene to produce phenyldodecane. All pillared catalysts perform high conversion of 1-dodecene more than 50%. Fe<sub>10</sub> pillared hectorite shows the highest conversion up to 72.50%. All samples show high selectivity to 2-phenyldodecane up to 45%. Conversely, when gallium was doped into the Fe<sub>10</sub>-pillared clay, the catalytic activity was dropped to 40%. However, 2-phenyldodecane is still the main product.

The catalytic activity of Fe-pillared hectorite is not different comparing with Fe-pillared bentonite. Therefore, the metal in octahedral clay framework does not affect the catalytic activity even though there is a difference in octahedral framework. Bentonite is composed of  $\text{Al}_2\text{O}_3$  in octahedral sheet whereas hectorite is  $\text{MgO}_2$ .

The used catalyst not only exhibits low conversion of 1-dodecene, but the selectivity to phenyldodecane product are decreased also. It may be due to blocking of organic compound in catalyst pore.



ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย