CHAPTER V

CONCLUSIONS AND SUGGESTIONS

5.1 Conclusions

This study indicated the result after pillaring natural clay from Koh Kred source and raw bentonite by tetraethylammonium chloride. Benonite could be enhanced into microporous and higher surface area. The BET result from ASAP 2000 analysis identified that bentonite became more microporous by increasing at 56% whereas Koh Kred's clay did not change surface area to higher porous material even all conditions.

Nevertheless, when bentonite was pillared with Tetra ethyl ammonium chloride, TEA, equivalent to 0.75, 1.00, 1.25, 1.50, 1.75, and 2.00 times of CEC, their surface areas were not significant different between times of CEC by averaging at 106.50 m^2/g and 145.1181 m^2/g for BET and Langmuir surface areas, respectively. In addition, considering to CEC, pillared bentonite became higher organophilic or hydrophobic characterization because of lower CEC to 37.3 meq/100 g or 44.7%.

The surface area of mixing materials between pillared bentonite and activated carbon with 3:2 ratios generated highest BET and Langmuir surface areas which are 471.36 and 667.65 m^2/g, respectively. When comparing with activated carbon, mixing material between pillared bentonite and activated carbon was outstanding lower surface area than activated carbon approximately at 35.5%.

The result of benzene, toluene and xylene adsorption, its determined that activated carbon encouraged high capacity of adsorption and higher than mixing material or PILB 32 approximately 7 times. As well as after 5^{th} regeneration times, activated carbon obtained higher benzene, toluene and xylene adsorption capacity with 9.18, 9.29 and 9.32 mg/g, respectively.

When considering to thermal effect on surface area and yield of materials, the modified bentonite or PILB32 was found to be superior to activated carbon due to specific structural characteristics of high thermal resistance. It encouraged that the strength structural characteristics could be applied for hazardous substance removal in high thermal circumstances.

5.2 Suggestions

Although, PILB 32 or modified bentonite can not be developed surface area as conventional activated carbon, it can be potentially applied for adsorption of high toxic substances. Almost organic toxic substances need to be destroyed at high temperatures such as dioxin and furan, so modified bentonite still remains their surface area and pore structure to adsorb this substance after regeneration times. In spite of this, activated carbon can not resist at high temperature and also it will loss yield to further adsorption.

In addition, modified bentonite by pillaring method is interesting to investigate and study for specific purpose. Because of their good properties in long-term adsorption, it can minimize activated carbon resource and indirectly reduce energy consumption as well. Therefore, modified bentonite is the one alternative adsorbent to apply for adsorption technology; anyhow it should be more studied and investigated to develop surface area and porosity for more capacity for organic compounds removal applications.

5.3 Suggestions for next research

Considering Koh Kred's clay, it could not be enhanced their surface area by ordinary pillaring method. It may be blended with many kinds of polymer to bond with negative charge on clay surface prior to pillaring method. This polymeric clay will characterize the hydrophobic clay and could be further develop more surface area by pillaring with quaternary ammonium ions, however.