CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

Liquid phase adsorption of four isomers of C_8 aromatics (*p*-xylene, *m*-xylene, *o*-xylene, and ethylbenzene) with toluene as a desorbent on *KY* and *KBaX* zeolites at was studied isothermally.

Both zeolites adsorbed preferentially *p*-xylene, followed by ethylbenzene, *m*-xylene, and *o*-xylene at the studied water contents and temperatures. On *KY* zeolite, selectivity of *p*-xylene relative to *o*-xylene was higher than selectivity *p*-xylene over *m*-xylene and ethylbenzene. The same trend can be observed in the case of *KBaX* zeolite. However, at the same conditions, *KY* zeolite had *p*-xylene selectivity higher than *KBaX*. This may be due to the difference in the zeolite acidity. The lower the acidity of the zeolite, the more selective to *p*-xylene.

At the higher operating temperature, the amount of each aromatic adsorbed by both zeolites was less than that at lower temperature. The adsorption process is exothermic; therefore, the zeolite adsorbs all the species less at the higher temperature. Moreover, as the temperature decreased, selectivity to *p*-xylene over the other C_8 aromatics for both *KY* and *KBaX* zeolites increased. Since C_8 aromatic adsorption is an equilibrium process, the transfer rate should be taken into consideration. The liquid phase adsorption process must be operated at a temperature that balances between the selectivity and transfer rate.

The increasing of water content in the zeolite reduced zeolite capacity and *p*-xylene selectivity. These can be observed in both *KY* and *KBaX* zeolites.

Both *KY* and *KBaX* zeolites adsorbed more *p*-xylene compared to toluene. Moreover, when competitively adsorbed with *p*-xylene, *KY* zeolite adsorbed more *p*-xylene and toluene than *KBaX* zeolite did. For *o*-xylene, *m*-xylene and ethylbenzene, like *KY* zeolite, *KBaX* zeolite with 1.2% LOI

showed the similar behavior as the adsorption of *p*-xylene. But for the high water contents, *KBaX* zeolite adsorbed about the same amount for both ethylbenzene and toluene

A simple linear model provided a good fit with a high degree of accuracy to the experimental data. From the model, the interaction between molecules is insignificant over the range of studied concentrations.

In addition, the multi-component pulse tests on *KY* zeolite were conducted. In the present of other C_8 aromatics, *KY* zeolite was selective for *p*-xylene. The selectivity of *p*-xylene over *m*-xylene is highest followed by *o*-xylene and ethybenzene. Moreover, the selectivity from the pulse test was higher than that from the single component experiment.

Since the experiments were carried out at very low concentration, higher concentration adsorption still needs further investigation. Besides, the multi-component adsorption is still an unexplainable phenomenon. Further study should be made in order to understand these complications.