



CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The effect of Si/Al ratio in the zeolite and ion exchanged on the adsorption capacity and selectivity was investigated in the batch adsorption system. In the single component adsorption systems, ion exchanged Y zeolites preferentially adsorb *m*-CNB more than *p*-CNB due to higher molecular dipole moment. All X zeolites have lower acidity than Y zeolites, so ion exchanged X zeolites have comparable adsorption capacities for both components except for LiX. The adsorption capacities of *m*-CNB and *p*-CNB on the series of X and Y zeolites increase with the decrease in the size of the cation due to the higher acid strength of the adsorbents. In the binary component systems, the total adsorption capacities and selectivity increase for both X and Y zeolites with the higher acid strength as in the single adsorption system. However, the selectivity decreases for LiY zeolite at the low concentration, and LiX and LiY zeolites at the high concentration due to smaller cation size. Not only does the acid-base interaction from the adsorbent play an important role in the adsorption capacity and selectivity, but also the molecular dipole moments of the adsorbates. The *m*-CNB/*p*-CNB selectivity of NaY zeolite is the highest at low and high equilibrium concentrations.

Results also reveal that there is competitive adsorption between a desorbent and CNB isomers. Benzene, toluene and *o*-xylene have low adsorption capacities compared to *m*-CNB and *p*-CNB due to the low desorbent-adsorbent interaction. But *o*-dichlorobenzene and nitrobenzene adsorption capacities are higher due to the high molecular dipole moment. The *m*-CNB/*p*-CNB selectivity of the *o*-dichlorobenzene system is the lowest due to the high *p*-CNB-desorbent interaction. With nitrobenzene, the *m*-CNB/*p*-CNB selectivity is almost the same as that of the system without the desorbent. The higher water contents in the zeolite structure decreases the *m*-CNB, nitrobenzene, and total adsorption capacities. The *m*-CNB/*p*-CNB selectivity is also decreased with the high water content.

5.2 Recommendations

Based on what has been discovered in this study, the following recommendations are suggested:

- 1) *o*-CNB should be studied for its effect on both single component adsorption, multi-component adsorption, and selectivity.
- 2) Dynamic adsorption of *m*- and *p*-CNB should be incorporated.