

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The effect of seven solvents-benzene, toluene, ethylbenzene (EB), p-diethylbenzene (pDEB), o-xylene, m-xylene, and p-xylene-on the isomerization and adsorptive separation of the 2,6-triad dimethylnaphthalenes (DMNs) was investigated in the batch system. Catalytic isomerization from 1,5- to 1,6- and 2,6-DMN was conducted over an H-beta catalyst in an autoclave reactor. It was found that the isomerization is carried out to a higher extent at higher temperatures in every solvent. However, only benzene and toluene facilitate the isomerization without promoting any side reactions. In a continuous system, the isomerization in benzene requires higher thermal energy. Toluene is the most suitable solvent for the isomerization of 1,5-DMN among the employed solvents in the continuous system.

All solvents were investigated for their effect on the adsorptive separation of 1,5-, 1,6-, and 2,6-DMN as desorbents over NaX and NaY by using the pulse test technique. The result reveals the competitive adsorption between the desorbent and DMNs, so the adsorptivity of the desorbent should be balanced with that of the DMNs in order to achieve good separation. The acid-base interaction from the adsorbent plays an important role by controlling both the DMNs and desorbent adsorptivity. However, in some desorbents, the interaction is not strong enough to dominate the desorption. For example, pDEB reveals a weak desorption because of its bulky molecule. Besides the acid-base interaction, the result shows that the Na cationic sites are important for the preferential adsorption of 1,5-DMN. The adsorption mechanism of DMNs via the acid-base interaction was further investigated by varying the Si/Al₂ ratios of the zeolites using EB, toluene, and p-xylene desorbents. The result postulates that the degree of dependency of the selectivity of 1,5- and 1,6-DMN with respect to 2,6-DMN can be adjusted according to the choice of the desorbents.

5.2 Recommendations

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

- 1) Other types of solvent, for example alkyl-paraffin and alkyl-olefin, should be studied for their effect on both isomerization and adsorption,
- 2) The effect of the Si/Al₂ ratio should be investigated to increase the conversion of 1,5DMN catalytic isomerization and reduce the reliability of the isomerization on thermal energy,
- 3) The equilibrium adsorption of 1,5-, 1,6-, and 2,6-DMN should be studied to understand their adsorption mechanism toward the faujasite zeolite.