CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Mercury removal from heavy naphtha (real feed before entering mercury removal unit) was studied. Adsorbents used to investigate mercury adsorption capacity were Beta zeolite with Si/Al ratios of 10, 30, and 100, X zeolite, Y zeolite and ZSM-5 zeolite. Beta zeolite with Si/Al ratio of 10 showed the best mercury removal capacity in heavy naphtha among the adsorbents tested. The kinetic of adsorption and adsorption isotherm were investigated in the batch experiments. It was found that the Lagergren equation 2nd order is the kinetic model that can be used properly to predict the kinetic of adsorption for all adsorbents. For adsorption isotherm, the Langmuir Isotherm model was found to be appropriate for describing the mercury concentration in liquid and solid phase at equilibrium and maximum mercury adsorption capacity of each adsorbents.

Heavy naphtha used in the experiment consists of two main species of mercury including metallic mercury (Hg^0) and ionic mercury. Besides, the adsorbents had very low efficiency in Hg^0 adsorption. It can be concluded that ionic mercury is the main specie absorbed on the adsorbents.

In the continuous system, Beta zeolite with Si/Al ratio of 10 and X zeolite showed the similar pattern of breakthrough curves and reached breakthrough time at 1 h in both cases and maximum of mercury adsorption capacity at 20 and 15 h, respectively. Moreover, the mathematical model was constructed on the assumption that ionic mercury was the only specie adsorbed on the adsorbents. The experimental data is not completely fit with the model. This may be due to the complexity of ionic mercury existing in heavy naphtha.

5.2 Recommendations

The study of natural mercury adsorption is rather complicated to understand due to the unknown species of mercury in heavy naphtha. The speciation of mercury in heavy naphtha is needed to study further so as to clearly realize which species of mercury can be adsorbed on the investigated adsorbent.