

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions from this study have been drawn :

- 1) H-ZSM-5 and NH_4 -ZSM-5 exhibited no significant difference in BTX selectivity of methanol conversion reaction.
- 2) The introduction of Fe in an optimum amount to H-ZSM-5 by ion-exchange improved the BTX selectivity; however, Fe-silicate which contains no Al in the framework gave considerably low BTX selectivity. This reflects that the strong acidity derived from the presence of Al plays an active role for the methanol conversion to aromatics.
- 3) The incorporation of Fe and Al as NH_4 -Fe.Al-silicate provided comparable BTX selectivity to that of Fe ion-exchanged ZSM-5; however, the former catalyst can be prepared in only one-step crystallization and needs no further ion-exchange.
- 4) The cation form (NH_4 or H-form) greatly affects the catalytic performance. H-Fe.Al-silicate yielded far less aromatics than the corresponding NH_4 form, probably caused from the rearrangement of Fe structure in the zeolite framework during the calcination of catalyst to convert from NH_4 to H-form.
- 5) H-Zn.Al-silicate with Si/Al and Si/Zn ratios of 40 represents the proper catalyst in this study to convert methanol to aromatics with BTX selectivity approximately 37 % at 500°C and GHSV 2000 h^{-1} . This selectivity was

comparable to that of Zn ion-exchanged ZSM-5 but H-Zn.Al-silicate can be prepared in one-step crystallization.

- 6) The appropriate reaction temperature range was 450-500° C. At higher temperature than 500° C, the considerable amount of CO₂ was formed probably by thermal cracking of methanol and thus the BTX selectivity decreased.
- 7) The catalyst regeneration by coke combustion with air at 550° C for 1.5 h almost recovered the catalyst activity and stability.
- 8) Pt/H-Zn.Al-silicate gave less aromatics than the catalyst without Pt but the aromatics selectivity was kept almost constant up to 10 h,
- 9) Fe or Zn might play a role on dehydrogenation of cycloparatfins occurred from the cyclization of oligomers of higher olefins. Such role in combination with the strong acidity derived from the presence of Al should be responsible for methanol conversion to aromatics.

The following further studies were recommended :

1. Investigate the change of local structure of Fe and/or Zn in ZSM-5 framework during the modification of cation form.
2. Study in detail the type of acidity, i.e. bronsted and lewis type, of the catalyst including to their role on methanol conversion to aromatics.