# CHAPTER VI

## CONCLUSIONS AND RECOMMENDATIONS

The dehydrogenation of propane was studied on the Zn-containing MFI type catalysts. Zn was introduced to the zeolite catalyst either by incorporation with the presence of Al, i.e. $NH_4$-Zn,Al-silicate, or by ion-exchange, i.e. Zn/$NH_4$-MFI. The results obtained lead to the following conclusions :

1. All the catalysts prepared had the MFI type structure as shown in their XRD patterns.

2. Zn plays the active role for the dehydrogenation of propane to propylene; however, Zn-silicate in absence of Al gave low activity. With the presence of Al, $NH_4$-Zn,Al-silicate exhibited higher propane conversion; however, too much of Al amount promoted the formation of aromatics and hence the lower selectivity for propylene. $NH_4$-Zn,Al-silicate with Si/Zn ratio of 40 and Si/Al ratio of 40 contained the proper acidity to convert propane to propylene with a good selectivity.

3. Zn ion-exchange MFI, Zn/$NH_4$-MFI, with 2.61 % by weight of Zn and Si/Al ratio of 40 exerted the comparable activity and propylene selectivity to $NH_4$-Zn,Al-silicate containing nearly the same amount of Zn.

4. Zn/$NH_4$-MFI exhibited the higher stability than did $NH_4$-Zn,Al-silicate. It has been concluded that Zn in Zn/$NH_4$-MFI can prevent the hydrogenation of light olefins to light paraffins such as ethane better than did Zn in $NH_4$-Zn,Al-silicate. The less hydrogenation of light olefins to light paraffins means the better hydrogen

conserved for hydrogen transfer to the carbonaceous deposit on the catalyst surface that responsible for the long catalyst life.

5. The $NH_4$-Zn,Al-silicate catalyst ion-exchanged with Pt, Pt/$NH_4$-Zn,Al-silicate, showed no significant improvement in catalyst life.

The recommendations for further study are be as follows :

1. Study the chemical state of Zn in the host zeolite and its coordination with the neighboring atoms to indicate the location of Zn.

2. Develop the stability of $NH_4$-Zn,Al-silicate, that can be prepared in only one-step crystallization, to be able to compare with Zn/$NH_4$-MFI.

3. Study the coke on the respective catalysts.

4. Study the dehydrogenation of propane to propylene on Zn-containing MFI type catalysts by vary the hydrogen ratio in feed gas.

5. Study the dehydrogenation of propane to propylene on the regenerated catalysts.