

CHAPTER 7

CONCLUSIONS AND FUTURE SUGGESTIONS

7.1 Conclusions

On the basis of the findings produced by this investigation, the following conclusions are presented. These conclusions are limited to the 0.5 wt% Pt/USY zeolite catalyst within the range of experimental conditions studied.

1) The 0.5 wt% platinum impregnated ultrastable Y zeolite was most suitable among the 6 catalysts studied for n-heptane isomerization. They were Pt/HM, Pd/HM, Pt/HY, Pd/HY, Pt/USY and Pd/USY with 0.5 wt% of metal content. In addition, the use of ultrastable Y zeolite as support should lead to remarkable resistance to deactivation and to improved thermal and hydrothermal stabilities (Vaughan, 1979, cited by Vansina et al., 1983). And, since the isomerization mechanism occurs via the carbonium ions, which are related to the acid strength of the catalyst, it may be postulated that the order of ranking of acid strength of the USY zeolite should be medium among the three types of zeolite supports used (HM, HY and USY).

2) Regarding the temperature effect, more n-heptane was converted as the reaction temperature rose. The temperature effect, however, became "saturated", i.e., when complete conversion was reached around 320°C.

- 3) The highest C₇ isomerization/cracking ratio was obtained at 260°C. Above 280°C the balance shifted towards more cracking.
- 4) The STY of iso-heptane increased with temperature and then passed through a maximum, which was due to the consumption of branched C₇ isomers by cracking.
- 5) As the reaction pressure increased, n-heptane conversion and iso-C₇ selectivity decreased.
- 6) The maximum STY of iso-heptane at 5 bars was essentially the same as at 10 and 20 bars, but the corresponding optimum temperatures were different, i.e., the higher the pressure, the higher the optimum temperature.
- 7) As the liquid space velocity of the feed increased, the conversion of n-heptane decreased at constant reaction temperature.
- 8) As the contact time increased, C₇ isomerization/cracking ratio decreased.
- 9) The higher the LHSV, the greater the maximum STY of iso-heptane and the higher the optimum temperature.
- 10) Within the pressure range used, the overall optimum pressure was 5 bars.
- 11) The observed primary products were the monobranched isomers of the n-heptane feed. Multibranched isomers and cracked products were formed in consecutive reactions.
- 12) For iso-heptane production based on the highest iso-heptane selectivity (minimum reactant loss) the hydroconversion of n-heptane should be operated at 260°C, pressure 5 bars and LHSV of 5.5 h⁻¹.

13) Based on the maximum STY of iso-heptane the hydroconversion should be carried out at 300°C, pressure 5 bars and LHSV of 30 h⁻¹.

14) For LPG production based on a minimum reactant loss, the hydroconversion of n-heptane should be carried out at 320°C, pressure 5 bars and LHSV of 2.7 h⁻¹, but if a maximum LPG production be desired, the hydroconversion should be operated at 320°C, pressure 5 bars and LHSV of 30 h⁻¹.

7.2 Future Suggestions

The major suggestions concerning future research were in the following aspects.

1. Though the activity of the 0.5 wt% Pt/USY catalyst is highest, attempt should be made to enhance its performance by trying other catalyst preparation techniques, such as ion exchange, instead of impregnation technique.

2. It would be interesting to study the effects of the platinum content and silica-alumina mole ratio in the USY zeolite.

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