CHAPTER 6
CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSIONS

Over the period there is necessity to replace the liquid acid catalyst by ecofriendly catalyst for the isomerization processes in petroleum refining industry. In this context several heterogeneous catalysts has been developed and reported for the processes but still there is an urge for a suitable ecofriendly catalyst recipe with controlled acidity for the isomerization reaction. Also the process prerequisite is the catalyst to predominantly fulfill acidity and surface area requirements and additionally produced minimum by product. The focus of the present study was to develop an improved catalyst recipe for the isomerization using the most suitable pathways for synthesis of such materials critically meeting the property requirements at low temperature. Keeping in view the following conclusion can be drawn for the work done in the current research.

- It is possible to synthesized of high surface area mesoporous crystalline zirconia by various routes namely: hydrothermal, microwave, precipitation, sol-gel synthesis. Sulphuric acid (0.5M) was used for sulphation, which enhance the surface area (88-280 m^2/g) and acidity (0.1-0.7 mmol/g) of zirconia. 10-60 wt. % amount of TPA was incorporated over the sulphated zirconia while an increase in the loading of TPA resulting increase in acidity and decrease surface area.
- Hydrothermal synthesis technique provide high surface area and high pore volume to a catalyst. The morphology of the samples shows that the particles are spherical in shape. The FTIR analysis showed that the surface sulphate group was bidentately co-ordinated to

the oxide surface. BET isotherm represented the equilibrium adsorption in prepared mesoporous catalyst. H_2-TPR shows the highest sulphate decomposion temperature.

- 55 wt. % loading of TPA loading showed the higher conversion for all the catalyst, the time on stream was 120 min. SZTW55 showed the highest conversion (69%). The reduction in the activity of the catalyst was due to the coke formation over the active sites rather than the other process of the deactivation such as sulphur removal, or decrease in the acidity.
- An increase in reaction temperature above 225°C induced a negative impact on the activity of the catalyst, at high temperature; the catalysts become less active, probably due to a loss of protons by dehydration
- TPA loaded sulphated zirconia catalyst appear to be good solid acid catalysts having potential to replace conventional corrosive expensive and hazardous catalyst for the isomerization of lower alkanes.

6.2 RECOMMENDATIONS

Based on present studies, the following recommendation may be made for future studies:

- Regeneration of various zirconia catalyst by thermal treatment in the presence/absence of inert atmosphere should be explore.
- The catalyst should be tested with metal promoter to evaluate the effect of the metal on the activity, selectivity and stability of the catalyst.
- Scale up reactor studies (On Pilot/ Mini-Plant/Commercial scale) should be conducted to evaluate the suitability of developed catalyst for the isomerization of light alkanes.