CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The following conclusions are drawn from the study:

1. The addition of nitrogen compounds even at low concentration in the feed solution affect hydrogenation reaction of benzene. The effects depend upon the nature of nitrogen compounds type and increase in the following order butylamine < pyrrolidine < quinoline < carbazole < indole , pyrrole < pyridine , pyrazine.

The deactivation effects can be classified depending on the characteristic nature of nitrogen compounds as follows:

1.1 The deactivation of catalyst increase with increase strength of basicity of the nitrogen compounds.

1.2 Straight chain nitrogen compounds decrease the reaction rate of benzene hydrogenation less than the cyclic nitrogen compounds due to their higher dissociation accompanied by evolution of alkanes.

1.3 Aliphatic cyclic compounds decrease the reaction rate of benzene hydrogenation less than the heterocyclic aromatic compounds due to their lower adsorption constant.

5.2 Recommendations

Recommendations for future studies and research are as follows.

1. A similar study should be conducted using another type of reactor such as flow reactor in order to study what type of deactivation effect, i.e. irreversible or reverible deactivation.

2. The same set of study should be conducted at different operating temperatures to study the effect of temperature on the deactivation of catalyst in benzene hydrogenation.

3. The amount of nitrogen compounds should be varied in order to study the effects of the concentration of nitrogen compounds.

4. Another hydrogenation catalyst such as Ni catalyst or Ni/Al_2O_3, should be used using the same operating condition in order to study the effect of nitrogen compound on catalyst directly.

5. A study should be conducted to determine the characteristics of the nitrogen compound.