

## CHAPTER V

### CONCLUSIONS AND RECOMMENDATIONS

In this work, the hydrogenation of tetralin was studied in the temperature range of 255-300 °C at a pressure of 300 psi over Ni/Al<sub>2</sub>O<sub>3</sub> catalyst. From the experiment the hydrogenation of tetralin was proposed by these the following reactions: (i) hydrogenation of tetralin to *cis*-decalin, (ii) hydrogenation of tetralin to *trans*-decalin, and (iii) reversible isomerization of *cis*- to *trans*-decalin. The generalized Langmuir-Hinshelwood model based on these reactions can fit with the experimental data at all temperatures investigated and the kinetic parameters are in good agreement with the physical meaningful and that obtained in the literature. In addition, the kinetic parameters obtained from this model are clearly not affected by the mass transfer limitations.

It is shown that the adsorption site competition plays an important role in the product distribution. The lower heat of adsorption of *cis*-decalin compared to tetralin shows that *cis*-decalin cannot overcome tetralin for adsorption. Therefore, the site coverage of *cis*-decalin is lower than that of tetralin under the studied conditions. This causes reactions lower *cis*- and *trans*-decalin isomerization reaction than the hydrogenation reactions of tetralin to *cis*- and *trans*-decalin. In addition, the high heats of adsorption of tetralin and hydrogen show that the adsorptions of these compounds are not thermodynamically favored at high temperatures. Therefore, the adsorptions of tetralin and hydrogen at high temperatures are rapidly decreased resulting in decreasing hydrogenation reaction rate.