

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

From the study based upon the results and discussions in previous chapter, several conclusions can be drawn as follows:

1. The hydrogenation of acetylene in the presence of large excess of ethylene was carried out at temperature ranging from 40 to 80 °C, gas hourly space velocities (GHSV) ranging from 2000 to 7000 h⁻¹ and atmospheric pressure to select the optimum operating conditions using Pd/Al₂O₃. The most suitable operating conditions were found to be 60 °C and 2000 h⁻¹.

2. The amount of palladium loading was varied from 0.01 to 0.09 wt% to see the effect of metal content on the performance of the catalyst. Increasing the amount of palladium loading enhanced catalyst performance up to a certain value. Further increase in palladium loading, however, caused a decrease in catalyst performance. It was found that catalyst with 0.04 wt% Pd loading exhibited the best performance.

3. Various amounts of Ag were added to 0.04 wt% Pd/Al₂O₃ to study the influence of a second metal on the performance of the catalyst. It was concluded that Ag addition decreased the site responsible for direct ethane formation and also lessened the chance of coke formation by serving as an atomic spacer. Furthermore it provided desorption sites for spillover hydrogen migrating from metal to support by way of carbonaceous deposits bridge. The promoted catalyst with Ag-to-Pd ratio of 4:1 gave the best performance.

4. Various amounts of nitrous oxide ranging from 0.02 to 0.33 cc were added to silver-promoted catalyst (Ag:Pd = 4:1). The promoted catalyst with 0.10 cc of N₂O exhibited the best performance. It might be concluded that N₂O addition could improve the performance of the promoted catalyst by enhancing active site reproduction.

5. Non-N₂O silver-promoted and N₂O silver-promoted catalysts were tested upon aging phenomenon. It was found that both catalysts showed high stability throughout aging period.

Recommendations:

1. The further study on mechanism of the selective hydrogenation of acetylene upon the addition of nitrous oxide is needed.

2. The effect of impregnation method of group 1B should be studied to compare the catalytic properties.

3. Comparison of effect of nitrous oxide on other promoters in the selective hydrogenation of acetylene over Pd/Al₂O₃ should be investigated.