

CHAPTER V

CONCLUSIONS

The addition of tin to the alumina-supported Pt catalyst enhances both the conversion of propane and selectivity to propylene of the catalyst. This is due to the ensemble effect and/or ligand effect of tin. Tin can form favorable ensemble sites of Pt for dehydrogenation reaction by splitting the contiguous sites of Pt. In addition, tin is stabilized by having an interaction with the support which results in platinum dispersion and an improved stability of catalytic activity. Coke formation on the Pt-Sn/Al₂O₃ catalyst is quite high because of the intrinsic acidity of the support.

The addition of lithium to the bimetallic Pt-Sn/Al₂O₃ catalyst can improve the activity, selectivity and stability of the catalyst. Lithium acts as a neutralization species for the acidity of the support. Consequently, coke formation and cracking are suppressed. These results are confirmed by the smaller changes in surface area, total pore volume and average pore diameter of the Li-promoted catalyst than those of the unpromoted one. However, the better catalytic activity cannot be obtained with the bimetallic Pt-Li/Al₂O₃ catalyst.

The Li/Pt ratio of unity shows the highest activity, selectivity and coke content. Therefore, the optimum ratio should be collectively considered among the activity, selectivity and coke formation. Further addition of lithium induces a substantial drop in activity of the trimetallic Pt-Sn-Li/Al₂O₃ catalyst because of the effect of residual nitrate species.

For the cycle runs, the catalyst which has the ratio of the promoter to the active agent of unity gives the highest yield. The evaporation of Li and

agglomeration of Pt particles during the second cycle considerably reduces the conversion of the Pt-Sn-Li supported on alumina catalyst. For the remaining cycles, they show few changes in conversion and selectivity. All catalysts appear to exhibit the same trend.