CHAPTER V
CONCLUSIONS

The pyrolysis of commercial and reprocessed polypropylene (PP) films was studied in a semi-batch reactor. The reaction was carried out at 500°C for 1 hour under nitrogen flow.

The thermal degradation of reprocessed polypropylene (PP) film was studied in terms of mechanical, rheological and thermal properties. It was clearly seen that the influence of the rheological property was remarkable, compared to that of the thermal and mechanical properties. Moreover, reprocessing of the film had an effect on pyrolysed product yield due to the change of the rheological and some thermal properties of the material. The number of reprocessing of PP film was a very important parameter controlling physical properties of the film and pyrolysed products. It was found that the weight percent of propylene and C_{20}^- hydrocarbons were varied as the same trend as the gas yield, and the weight percent of $C_{20} - C_{49}$ was varied as the same trend as the liquid yield.

Sulfated zirconia (SO_4^{2-}/ZrO_2) was employed in catalytic degradation of commercial PP film. Catalyst to polymer (C/P) ratio was varied from 0.0 to 1.0 using 4% of sulfate loaded on zirconia. The result showed that an increase of C/P ratio caused a decrease of gas with an increase of liquid yield especially a lighter liquid fraction. Moreover, some gas components such as propylene (C_3) and C_4 hydrocarbons significantly changed. As the C/P ratio was increased, there was a decrease in selectivity of C_3/C_4 since propylene tended to decrease with a consequent increase in C_4 components. This result showed a special feature of the solid acid catalyst degradation of polypropylene according to carbenium ion mechanism. Gasoline can be produced when the catalyst was introduced. C/P ratio of 0.17 showed a great difference in liquid product composition as compared to other C/P ratios. Hence, it was selected to study the effect of an amount of sulfate loaded on zirconia on pyrolysed products.

As the amount of sulfate increased, the liquid yield increased with a consequent decrease in gas yield. In addition, there were also changes of some gas components which were propylene and C_4 components as observed in C/P ratio

effect. In brief, the higher the amount of sulfate loaded on zirconia, the higher C_4 hydrocarbons were produced, and the higher the catalytic degradation of the film was occurred via carbenium ion mechanism. Furthermore, kerosene and fuel oil were continuously increased as the amount of sulfate increased and caused the decrease in the heavy fraction.