CHAPTER V

CONCLUSIONS

The pyrolysis of biodegradable composites was studied in a thermogravimetric analysis. The reaction was carried out in order to investigate the effect of cassava starch and microcrystalline cellulose contents on pyrolysis product yields and the apparent kinetic parameters. The following is a summary derived from this work.

1. The kinetic and thermal conversion behaviors of PP and PP biodegradable composites were studied at 10, 20, and 30°C/min^{-1} heating rates. The results showed that the onset of thermal decomposition temperature (T_d) of PP at approximately 400°C. At the end of the experiment with the temperature setting to 600°C, the complete weight loss of samples can be observed with no char residue remained.
2. In the presences of biodegradable additives, starch and cellulose were both influenced the PP decomposition mechanism by lowering the Td onset of PP by 12 and 10°C, respectively. Starch and cellulose were both resulting in gas products increment from 34 to 39% and 36%, respectively. And the decrement of liquid products from 66 to 59.5% and 60.8%, respectively. The char residue was observed at the end of the experiment.
3. The influence on thermal decomposition behavior and pyrolysis product in the presence of biodegradable additives might be due to the char residue formed during PP decomposition have some catalytic effects on promoted the formation of radical which could accelerated PP decomposition process and resulting in increment of gas product obtained.
4. The apparent kinetic parameter also shown that biodegradable additives provoked the thermal decomposition processes of PP by lowering the activation energy.

5. Pyrolysis of PP composites yields greater quantity of lower molecular weight fuel gas products. The maximum gas fraction obtained from the highest addition (20%) of both additives to PP with 3.0% and 3.9% increase in fuel gas fraction for addition of cellulose and starch, respectively, at the cost of lower liquid fraction. Since higher low molecular weight products are generally preferable to heavier fuel fractions which may contain some undesirable tars, so the addition of these additives would improve the waste utilization and management of spent PP composites by not only making it biodegradable but also enhance its fuel production through thermal degradation process. For the work reported here, addition of 20% starch to PP is the most favorable choice and probably even better with greater percentage though this may be limited by declining mechanical properties of high additive composites.