CHAPTER V

CONCLUSION

Although there are many advantages of wood flour, such as low density, low abrasion and low cost, its disadvantages are the limited thermal stability and the limited compatibility of wood flour and polypropylene matrix. However, the first problem could be avoided by processing at 200 ^{o}C because the severe degradation of the composite was observed at the temperatures exceeding 200 ^{o}C. The latter problem could be solved by using coupling agent. In this work, the mechanical properties the four composites with five levels (10 to 50% by weight) of WF in PP mattrix were studied. These four composites were PP-untreated WF, PP-silane A-1100 treated WF, PP-silane A-174 treated WF, and PP-Epolene E-43P treated WF. The major findings and conclusions in this work are as follows:

The optimum concentration of Epolene E-43P in WF-filled PP system was 2% (by weight of WF) because it provided the high tensile strength, tensile modulus and hardness. The higher the concentration of Epolene E-43P, the darker the color of composite. Moreover, impact energy dropped throughout all ranges of Epolene E-43P concentration, the considerable reasons were the greater reinforcement induced by the Epolene E-43P and the greater wood brittleness induced by degradation.

For the untreated WF as filler, the deterioration of the tensile strength, elongation at break and impact energy of composites may be due to the poor adhesion of two phases and the properties of WF itself (eg. lignin content, pore struture ,etc.).

The tensile strength of the WF-filled PP composite was improved by the addition of the coupling agent which gave the better interfacial adhesion. Among the three coupling agents used, the composite containing Epolene E-43P produced the highest tensile strength, tensile modulus and hardness; elongation at rupture and impact energy still decreased with increasing WF contents.

The enchanced interfacial adhesion can be confirmed by the results of fracture surface of SEM study, polarity of WF residue and DTA analysis. The scanning electron microscrographs of the PP-treated WF composites showed the good dispersing effect and bonding at the interface evidenced by less wood flour was pulled out from the PP matrix. In the examination of polarity, WF residue at the interlayer of ether-water indicated the strong interfacial adhesion in the composite. In an analysis of DTA, the elevation of T_m of the PP-treated WF composites was greater than that of the PP-untreated WF composite which implied that the PP-treated WF required more energy in changing the state. The results indicated that the PP-treated WF composite produced the high compatibility of WF and PP induced by the coupling agent.

It can be concluded that the best coupling agent for WF-filled PP system in this work was Epolene E-43P. Furthermore, Epolene-E-43P can also be used as processing and dispersing aid.

Wood flour obtained from sawdust, a waste of wood manufacturing, appears to be a potential filler for polypropylene. The more the WF content, the higher the cost reduction of the composite.

The use of wood or natural cellulosic product as a filler in high volume thermoplastic resins should be further studied in the aspect of:

1) Effect of fabrication technique on the distribution of filler in compounding, e.g. in an extruder.

2) Effect of the characteristics of such natural filler on the properties of the composite, e.g. the aspect ratio of filler.