

CHAPTER VII

CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

In this research, acetate groups of EVA was modified by transesterification reaction with 1-dodecanol and dibutyl tin dilaurate (DBTL) catalyst in a twin-screw extruder at screw speed 10 rpm. The result from FTIR showed the occurrence of weak absorption band of hydroxyl groups at about 3500 cm^{-1} in modified EVA. This can be confirmed by the results of DMA. The modified EVA (mEVA) represented the higher glass transition temperature (T_g) than that of pure EVA due to the existence of hydrogen bonding along the mEVA chains. Then mEVA was blended with PLA at various ratio of mEVA (10, 20, 30, and 40 wt%). The PLA/mEVA blends were prepared in a co-rotating twin-screw extruder with screw speed 30 rpm. According to the DSC results, PLA/mEVA blends exhibited the two glass transition temperatures that can assume as the two-phase system or immiscible blends of PLA/mEVA blends. The increment of mEVA loading in the PLA/mEVA blends caused a decrease in glass transition temperature (T_g) (from $58\text{ }^\circ\text{C}$ to $55\text{ }^\circ\text{C}$). Moreover, the cold crystallization temperature, degree of crystallization, storage modulus, and Young's modulus were decreased due to the presence of soft amorphous phase. However, the elongation at break of the blends enhanced with the increasing in mEVA and indicated the optimum elongation at 30wt% of mEVA. Morphological interpretation through FE-SEM reveals the phase separation of the PLA/mEVA blends in the presence of mEVA. As a result of MFI value, mEVA can facilitate processability of PLA/mEVA blends. However, mEVA retarded biodegradability of PLA. Morphological interpretation through FE-SEM reveals the phase separation between the PLA/mEVA blends in the presence of mEVA. Therefore, the incorporation of four different types of compatibilizers in PLA/mEVA blends was investigated in order to improve the compatibility; i.e. Ethylene-glycidyl methacrylate copolymer (E-GMA), Ethylene-methyl acrylate-glycidyl methacrylate terpolymer (T-GMA), Ethylene-acrylic acid copolymer (PE-AA), and Poly(2-ethyl-

2-oxazoline) (Oxa) at 5, 10 and 15 phr. The result from FTIR revealed that the decreasing of the absorbance ratio at the peak 910/2850, 1730/2850 and 3500/2850 cm^{-1} and the increasing of the absorbance ratio at the peak 1200/2850, 1685/2850 and 3300/2850 cm^{-1} were confirm chemical reactions between compatibilizers and the PLA/mEVA blends. PLA/mEVA blends with all compatibilizers still exhibited the two glass transition temperatures. The increasing in all compatibilizers loading in the PLA/mEVA blends caused an increase in glass transition temperature (T_g). For the DSC results, degree of crystallization decreased with the increment of E-GMA and PE-AA compatibilizers. On the other hand, T-GMA and Oxa compatibilizers enhanced degree of crystallization. Moreover, storage modulus was decreased with the increase of all compatibilizers contents. Morphological interpretation through FE-SEM revealed the improvement in miscibility of the PLA/mEVA blends in the presence of all compatibilizers. Young's modulus and tensile strength were dropped; however, elongation at break increased with the supplement of all compatibilizers. The addition of E-GMA and T-GMA compatibilizers in the PLA/mEVA blends led to a dramatic reduction of the MFI values of the blends and retarded biodegradable property of PLA blends. On the contrary, The MFI values and biodegradability of the PLA/mEVA blends were enhanced with the incorporation of PE-AA and Oxa compatibilizers. In summation, the PLA/mEVA blends with all compatibilizers could inject into dumbbell-shape specimens by injection molding.

7.2 Recommendation

Based on what have been discovered in this study, the following recommendation is suggested.

(1) The other compatibilizer which has difference reactive functional groups from thesis will be used.