CHAPTER VII
CONCLUSIONS AND RECOMMENDATIONS

Graft copolymerization of polylactide (PLA) onto ethylene (vinyl acetate) (EVA) has been synthesized by catalytic reactive extrusion in an intermeshing co-rotating twin–screw extruder. In this work, functional group of EVA was modified by transesterification reaction with 1-dodecanol and DBTDL catalyst in a twin–screw extruder at various screw speeds (10, 20, 30, and 40 rpm) prior to reaction with PLA. The results from FTIR showed that the modified EVA produced at 10 rpm had the lowest absorbance ratio of residual carbonyl groups to internal standard peak, which imply that the modified EVA produced at 10 rpm yield the highest conversion. This can be confirmed by the results from DMA, which presented the highest T_g Then the modified EVA produced at 10 rpm was brought to react with PLA, the ratio of EVA: PLA was 40: 60, via catalytic reactive extrusion with various contents of $Sn(Oct)_2$ catalyst (0.1, 0.3, and 0.5%wt) and at screw speeds of 30 and 40 rpm, in order to from the EVA-g-PLA. TGA thermogram of EVA-g-PLA produced at 30 rpm showed %weight loss corresponding to the original contents, where the graft copolymer produced at 40 rpm exhibited inhomogeneity. And the graft copolymer produced at 30 rpm exhibited higher crystallinity. Moreover, the SEM images of the graft copolymer produced at 30 rpm also showed better compatibility, where tensile properties were quite comparable. However, phase separation can be seen for any condition except the EVA-g-PLA produced at 30 rpm with 0.3%wt, which showed the finest dispersion. Therefore, lactide monomer was introduced into the system as an initiator for grafting reaction. However, phase separations were highly pronounced when LA was introduced to the system at screw speeds of 30 and 40 rpm. Moreover, the modular twin-screw extruder (SHJ-36, Nanjing Giant Machinery Co., Ltd.) with five mixing zones was used as a reactor at screw speed of 150 rpm, in order to improve melt mixing of those two phases. SEM revealed the considerable morphology when it was mixed in a five-mixing zone extruder at screw speed of 150 rpm with 0.3%wt of $Sn(Oct)_2$ and no LA, which showed the finest dispersion as well as the graft copolymer produced with 0.3%wt $Sn(Oct)_2$ at 30 rpm without LA. As a result, the highest conversion of EVA-g-PLA, which worked as a compatibilizer,

increased interfacial activity of both EVA and PLA homopolymers. Therefore, the suitable amount of catalyst and screw speed are 0.3%wt $Sn(Oct)_2$ and 30 rpm and/or 150 rpm, respectively.

Recommendations

The conversion of EVA-g-PLA should be investigated. Besides, molecular weight of the synthesized EVA-g-PLA should be considered. Moreover, the biodegradability of EVA-g-PLA should be studied.