CHAPTER VI
CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

6.1.1 Miscible blends of ESCOR^{TM} 325 terpolymers and EAA copolymers

The miscibility of blends was investigated by dynamic mechanical and rheological measurements. Thermal, mechanical, and dynamic mechanical properties of the ESCOR^{TM} 325/EAAs blends were also studied. From the rheological measurement, the miscibility in molten state of ESCOR^{TM} 325/EAA5 was observed at EAA5 content greater than 40%. It might be suggested that the chemical nature of the components was very similar, and most of processing parameters was the same

In addition, the rheological properties such as the storage and loss modulus of the blends were slightly increased with increased EAA contents, but the complex viscosity of the blend decreased with increased EAA contents.

From thermal analysis, the crystallization and melting temperature of pure copolymers suggest that the possible tendency from high to low amount of minor monomer in a random copolymer or terpolymer are EAA1, EAA2, EAA4, EAA5 and ESCOR^{TM} 325, respectively. This is because of EAA1 gave the highest crystallization temperature; indicating that EAA1 has the lowest impurity or amount of acrylic acid. For the crystallization curves of blends of ESCOR^{TM} 325 and four different grades of EAA at 60, 50, 40, and 20 %wt of EAA content. They showed two crystallization peaks, which is probably due to the different crystallization rate between ESCOR^{TM} 325 and EAA copolymers. However, the crystallization peaks of these blends were higher than those of the pure components, this may be due to some interaction between two components. These results corresponded to results obtained from melting temperature results. Crystallization curves of ESCOR^{TM} 325/EAA1, 2, 4 and 5 blends at over 80%wt EAA content showed only a single crystallization temperature. This was because of co-crystallization and was corresponded to their melting temperatures.

Most blends exhibited improvement in tensile strength at break, Young's modulus, hardness (shore-D), and a reduction in elongation at break with the increase in EAA content. The ESCOR^{TM} 325/EAA1 and ESCOR^{TM} 325/EAA5 blends consisted EAA content from 80 to 95%wt in blends showed synergestic behavior (tensile strength, young's modulus and hardness) due to higher percent crystallinity.

6.1.2 Non-isothermal melt crystallization kinetics of ESCOR^{TM} 325 terpolymers and EAA copolymers

The non-isothermal melt crystallization exotherms for four different grades of EAA copolymers and three different grades of ESCOR^{TM} terpolymers showed that the temperature at 1% relative crystallinity, the temperature at the maximum crystallization rate, and the temperature at 99% relative crystallinity were all shifted towards lower temperatures with an increase in cooling rate used, indicating that these resins took a shorter time to crystallize when the cooling rate increased. The Ozawa model was found to provide a satisfactorily good fit to the experimental data. For all of the resins studied, the Ozawa exponent was found to range from ca. 2.1 to 5.3 and the Ozawa crystallization rate constant was found to decrease with increasing temperature (within the temperature range investigated), suggesting that these resins crystallized slower with increasing temperature.

The comparative ability for these resins to crystallize from the molten state under a unit cooling rate can be evaluated from the values of the Ziabicki's kinetic crystallizability, which suggested that the ability for these resins to crystallize fell on the following order: EAA1 > EAA4 > EAA2 > EAA5 ≈ ESCOR^{TM} 310 > ESCOR^{TM} 320 > ESCOR^{TM} 325. However, when judging from the observation of the raw non-isothermal melt crystallization exotherms and the values of the effective energy barrier governing the non-isothermal melt crystallization for these resins, the ability for these resins to crystallize was in the following sequence: EAA1 > EAA2 > EAA4 > EAA5 > ESCOR^{TM} 310> ESCOR^{TM} 320 > ESCOR^{TM} 325. It was postulated that the amount of co-monomer defects was responsible for such behavior.

6.2 Recommendations

In this research did not determine the morphology of the ESCOR^{TM} 325/EAA blends. However, the morphology should be studied in future work.