

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

Poly(ethylene terephthalate) can be used as raw material for synthesizing unsaturated polyester by depolymerizing it with ethylene glycol and propylene glycol in to monomer and then reacted with maleic acid. The main purpose of the present research is to study the effect of depolymerization time and molar ratio of (EG+PG)/PET on glycolyzed product and unsaturated polyesters. The conclusions of this study can be listed in the following.

6.1.1 Conclusions of depolymerization of PET

1. Longer depolymerization time increases hydroxyl value but decreases molecular weight and % free glycol. These results indicate increasing of BHET and depolymerization rate in first two hours of depolymerization
2. Molar ratio of (EG+PG)/PET has effect on glycolyzed product by increasing hydroxyl value and % free glycol but decreasing molecular weight. These results were due to increasing of BHET and decreasing of dimer. This indicated that amount of EG and PG is important to depolymerized PET to obtained predominant amount of BHET or dimer in glycolyzed product

6.1.2 Conclusions of synthesis of unsaturated polyester

1. Impact strength and hardness of unsaturated polyester increased with depolymerization time of glycolyzed product because of glycolyzed product consisted of more BHET. Then unsaturated polyester consisted of more unsaturated group and cross-linking

2. Impact strength of unsaturated polyester increased with molar ratio of (EG+PG)/PET of glycolyzed product because of high degree of cross-linking from BHET and remained glycol.

3. Hardness of unsaturated polyester increase at low molar ratio of (EG+PG)/PET but it decrease at high molar ratio.

6.2 RECOMMENDATIONS

The recommendations for further research may be given as follows:

1. Study other operating variable that effect on glycolyzed product and unsaturated polyester such as temperature and pressure of depolymerization.

2. Study effect of raw material on mechanical properties of unsaturated polyester for example, use different type of diols for depolymerized PET such as ethylene glycol, propylene glycol, diethylene glycol or their mixture for study effect of chemical structure of diols on final product. Furthermore different type of PET such as fiber, sheet or film should be studied. This study will be useful to recycling of various grade of PET wastes.

3. Modifying properties of unsaturated polyester by adding filler and compare its properties with commercial unsaturated polyester.