CHAPTER I

INTRODUCTION

Nowadays, polymers have been extensively used and the example of polymers are polyethylene, polypropylene, polystyrene etc.. Poly(ethylene terephthalate) termed (PET) is one of the polymers that has been widely used in polymer industry, because it is thermoplastic with good properties such as high strength, toughness and clarity combined with low permeability to carbon dioxide, oxygen and water vapour. PET bottles are very extensively used for carbonated beverages and other food products [1].

The volume of post-consumed bottles has been rapidly increased and the problem about PET waste is difficult to eliminated. Recycling of PET waste is one of the methods that reduce this problem. Recycling of PET waste can be done by depolymerized into its monomer and higher oligomers. The monomers thus obtained can then be used as building blocks to synthesize other polymers with higher economical values, such as polyols or unsaturated polyesters[2].

The unsaturated polyester (UP) resins are used extensively as a matrix for fiber-reinforced composits, which are replacing conventional structural materials like steel and wood in a variety of engineering application. The fiber-reinforced plastics, termed FPR, offer excellent chemical resistance, weaterability, high strength to weight ratio, versatility of product design, and ease of fabrication. The widespread use of UP resins in the FPR industry is due to their low cost and the wide variety of grades available to meet specific property requirements[3].

The mechanical performance and chemical resistance characteristics of UP resins are generally modified by appropriate choice of the diols and diacids used as the building blocks of the polymer. The most commonly used diacids are orthophthalic

anhydride, isophthalic acid and maleic anhydride, whereas the diols include ethylene glycol, propylene glycol and neopentyl glycol. Depolymerized PET waste can be effectively used to produce UP resins with performance characteristics comparable to the conventional grades. This process is commercially important since it converts a waste material into a useful value-added product[3].

1.1 THE STATEMENT OF THE PROBLEM

At present, the problem about PET waste has rapidly increased and is difficult to eliminated. Thus to reduced this problem, we should study the recycle of PET waste by depolymerization into its monomer and higher oligomers which are used for synthesizing unsaturated polyester resin, a value-added product in industry.

1.2 THE OBJECTIVES OF THE THESIS

1.2.1 To study the synthesis of unsaturated polyesters from post-consumer PET bottles.

1.2.2 To study operating variables that effect properties of unsaturated polyesters.

1.2.3 To study and compare mechanical properties of unsaturated polyesters produced from PET bottles.

1.3 THE SCOPE OF THE THESIS

1.3.1 Synthesize glycolyzed product by depolymerization of PET bottles with diols such as ethylene glycol and propylene glycol.

1.3.2 Vary operating variables of depolymerization of PET bottles

- Molar ratio of PET bottles and diols were varied between 1:1 to 1:4

- Depolymerization times were varied between 1-8 hours.

1.3.3 Compare the effects of operating variables of depolymerization of PET bottles.

1.3.4 Synthesize unsaturated polyesters from glycolyzed product at various operating conditions.

1.3.5 Cast unsaturated polyesters and evaluate their mechanical properties.