CHAPTER I

INTRODUCTION

Plastic materials play an important role in modern daily life. Due to their many advantages such as light weight, diversity in products and colours as well as low costs, the demand of plastic products has been growing every year. High consumption, of course, leads to a great quantity of wastes. Nowadays a growth in the amount of plastic wastes causes an increasing impact on our living environment. Therefore, several re-utilisation or recycling methods for plastics have been developed and further study has become important. Plastic wastes can be roughly divided into thermosetting and thermoplastic wastes. Thermoplastics are defined as linear or branched polymers which can be made to become soft and take on new shapes by the application of heat and pressure. Thermosettings are crosslinked polymers which are stable to heat and cannot be made to flow or melt [1]. Regardless the difficulties in recycling crosslinked plastics, including polyurethanes, both types of plastic wastes can now be recycled to a certain degree, mainly by mechanical means, into new products. However, there are many other ways to reuse these wastes such as chemical recycling [2-21], energy recovery [2,3,22] and any conbination of these. Apart from these re-utilisation methods, the landfill has been used to eliminate the plastic wastes but space limitation is anticipated in the near future.

According to the primary characteristics of thermoplastic materials, this type of materials, such as polyethylene, polypropylene and polystyrene, can be recycled by common remelting methods. But, unlike thermoplastic materials, thermosetting materials cannot be reused by these ways. Polyurethane studied in this work is one of thermosetting materials. Because of its simple chemistry, various types of products are obtained including flexible and rigid foams, thermoset and thermoplastic elastomers, products obtained from reaction injection molding (RIM), adhesives, coatings, sealants, fibers, and films. Among these various kinds of products, polyurethane foams are the most widely used [2]. The largest application of flexible polyurethane foam is in furniture cushions while the major usage of rigid polyurethane foam is as insulation materials. Enormous quantities of the foam scraps are generated from manufacturing processes, worn-out molded polyurethane parts and past-used old products. Therefore, excellent management to ease the environmental impacts from foam scraps becomes essential.

This study focused on the attempt to recycle rigid polyurethane foam by chemical means. Glycolysis of polyurethane foam was carried out at a moderate temperature. The liquid glycolyzed products obtained were used without further purification as a hardener for the curing of epoxy resin. The investigation has resulted in crosslinked epoxy resin with good thermal and mechanical properties as well as established a novel method for the recycling of polyurethane foams.