CHAPTER I
INTRODUCTION

A polymer blend or polymer mixture is a member class of materials, which are comparable to metal alloys, in which at least two polymers are blended together in order to create a new material with different physical properties. Blending polymers not only can develop novel materials which combine physical and mechanical properties of their components, depending on the composition and level of compatibility but also offer low cost alternatives to the development of entirely new materials with improved properties. Therefore, the blending technology is one of the most excellent methods, presently receiving great attention for making a polymer compound.

It is well known that polycarbonate (PC) is used in a variety of applications including glass replacement, housings, medical devices and containers because of its excellent properties such as high thermal stability, high impact strength, good dimensional stability, good stiffness and most remarkably good transparency. However, PC does have some disadvantages such as poor scratch resistance, poor long-term UV resistance and stress birefringence, which have to be dealt with especially in demanding optical applications. On the other hand, poly(methyl methacrylate) (PMMA) is widely used in various applications such as window glazings and automotive lenses or light covers. Although, it has excellent properties with its clarity, surface hardness, UV resistance, good weather ability and chemical resistance, it is still restricted by its relatively poor dimensional stability, low impact strength and low thermal stability. To overcome the drawbacks of both components, the combination of PC and PMMA has also received considerable attention.

Although blending of PC and PMMA would be required to eliminate their individual drawbacks and result in synergism of mechanical and optical properties of each material that is suitable for a wide range of applications and also takes down the cost without affecting the other properties significantly, the blend shows phase-separated morphology with poor interfacial adhesion and resulting in poor final properties. In order to improve the miscibility of PC/PMMA blend, compatibilizers are used to control the morphology of the blends. Compatibilization is often carried out to reduce the size of the dispersion phase and/or to stabilize the morphology of the blends. The use of compatibilizer can favor a fine dispersion by lowering the interfacial tension, stabilizing the morphology by reducing coalescence and improving the interfacial adhesion between phases. There are many techniques of compatibilization for blending. For example, the traditional method is the addition of a common physical compatibilizer. In recent year, the novel technique was paid attention to the use of reactive compatibilizer and inorganic solid particles as a compatibilizer. However, it is known that using the latter is a newly explored compatibilization that combines the advantages of both polymer blends and nanocomposite technologies. For using copolymer modification of the blend, various patented strategies were purposed to compatibilize PC and PMMA in order to improve the miscibility and still maintain transparency of the blends.

The main objectives of this study are to investigate the effect of the compatibilizers and catalysts on the mechanical properties, physical properties, optical properties and morphology of PC/PMMA alloys. The optimization of the compatibilizers and catalysts used in PC/PMMA alloys were compared to neat PC, PMMA and PC/PMMA blends without compatibilizer. In this study, poly(ethylene-*co*-methacrylic acid) (EMAA) ethylene methacrylate copolymer (EMA) and ethylene/methyl acrylate/glycidyl methacrylate terpolymer (EMG) were used as the compatibilizer to improve the compatibility and still maintain transparency of the blends. Therefore, it was expected that acid groups of Surlyn and ester groups of EMA could interact with both the carbonyl groups of PC and the polar ester at the pendant groups of PMMA to increase compatibility between PC and PMMA. In the case of catalysts, samarium acetylacetonate hydrate (SMACA) and Tin(II)chloride dehydrate ($SnCl_2.2H_2O$) was used in this study in order to induce the transesterification reaction to generate the graft copolymer of PC and PMMA, which act as a compatibilizer by itself. Then, these two catalysts were expected to produce PC-*g*-PMMA copolymer. The result presented the significant improvement in impact strength of PC/PMMA alloys was obtained by adding EMA and EMG. In addition, the suitable ratio of the best material was blended and compared the performances with one of commercially available benchmark. Finally, PC80/PMMA20/EMA5 and

PC80/PMMA20/EMG1 alloys were chosen to compare their properties with commercial PC/PMMA. The obtained mechanical properties of these alloys were superior to PC and PC/PMMA of benchmarks.