CHAPTER I

INTRODUCTION

1.1 The Statement of Problem

Everyday, landfills over the world are packed well above their capacities, and new landfills have to be opened up more. Plastics account for about 20 percent by volume of the landfill space. Currently, many cities have run out of space to dispose their trashes and paid for shipping to remote locations. It is only a matter of time until the area run out. It is estimated that the global resources of oil will run out within 80 years, natural gas within 70 years and coal within 700 years, but the economic impact could drive the depletion to happen sooner; thus the prices will likely soar as resources are depleted [1].

Biodegradable polymers are an alternative in recent years because of their wide range application in packaging and medical device. In 1932, Carothers, a scientist from DuPont, produced a low molecular weight product by heating lactic acid under a vacuum [2]. Polylactide (PLA) is a biodegradable, thermoplastic, and aliphatic polyester. The monomer can be derived from lactic acid in which dextrose turned into lactic acid via fermentation of corn, sugar beets, wheat, and other starch rich products [3].

Polypropylene (PP) is a commercial polymer which used for packaging industrial application but it is a non-degradable waste after their function has expired. While polylactide has been increasingly interesting in large volume production of fibers and films for alternative choice to produce degradable plastic blend, this research thus focuses on polypropylene and polylactide blending using poly[propylene-*graft*-(maleic anhydride)] (PP-*g*-MA) as a compatibilizer.

It is well known that phthalocyanine pigments and quinacridone pigments are able to act as nucleating agents, inducing crystallization, and influencing the dimensional stability of extrudate products by causing shrinkage and warpage [4].

The incompatibility of polymeric blends is responsible for poor mechanical properties because of a lack of physical and chemical interactions across the phase boundaries and poor interaction adhesion. Therefore, the compatibilization is demanded to obtain a blend with desired properties. A common way to improve the compatibility and interfacial adhesion of polymer blends is to add compatibilizers or interfacial agents [5].

Biodegradable polyester is by far incompatible with polyolefins [6]. Its blending system needs improved compatibilization. Polypropylene/Polylactide blends with PP-*g*-MA as a compatibilizer and crystallization affected by pigment nucleating agents were studied.

1.2 Objectives

The objectives of this research are as follows :

1. To study the effects of quinacridone and phthalocyanine blue pigment on the PP/PLA blends at various blending ratios using PP-*g*-MA as a compatibilizer.

2. To compare the mechanical properties, physical properties, morphology and optical properties of the pigmented polypropylene/polylactide blends.

1.3 Scope of the Investigation

The polypropylene/polylactide blends were prepared with quinacridone pigmentation, phthalocyanine blue pigmentation and 1,2,3,4-bis(3,4-dimethyl-benzylidene sorbitol); DMDBS at various ratios.

The experimental procedures were carried on as follows :

1. Review literature and research work.

2. Prepare the PP/PLA of blends at various ratios using a twin screw extruder.

3. Investigate mechanical properties, physical properties, optical micrograph, morphology, and %crystallinity of the blends.

4. Summarize and analyze the results of the experimental.