CHAPTER I

INTRODUCTION

1.1 General Introduction

The development of polymer blends has been highly significant over the recent years. Volume production of completely new homopolymers at commercial availability has, so far, been relatively small. The rapid progress in the polymer blend industry is attributed to its relatively short duration associated with the development and its low investment cost. Unlike a polymerisation plant for a homopolymer or a copolymer, the production of polymer blends by reactive extrusion can be a medium-scale industry. This is because it requires only a few pieces of equipments which are generally not too costly. Furthermore, certain equipments nowadays offer a variety of modifications in which the equipment users can choose to best suit their particular needs. An example of which includes a twin-screw extruder which can be adjusted to suit the processes required by each system of polymer blends. So, there are abundant opportunities for polymer engineers to produce or to develop many kinds of polymer blends.

The first commercial polymer blend is high-impact polystyrene (HiPS) which is an improved polystyrene (PS). Structurally, polystyrene is an amorphous thermoplastic. It is transparent and brittle. By adding rubber, the impact strength is increased considerably.

There are many reasons for blending polymer systems. However, the main reason for blending is economy. Via the technique of blending, polymeric materials can be produced at a lower cost while their property specifications still meet those set by the users. The quality of the blend is either the same as or superior to the existing constituent materials in the market. Users of the polymer blends will enjoy the cost saving advantage.

In general, in view of economy, reasons for blending polymers can be listed as follows:-

1. Extending engineering resin performance by diluting it with a low-cost polymer.
2. Developing materials with a full set of desired properties.
3. Forming a high performance blend from synergistically interacting polymer.
4. Adjusting the composition of the blend to customers' specifications.
5. Recycling industrial and/or municipal plastics scraps.

In 1980, polymer alloy and polymer blend technology was essentially unknown on a broad commercial basis. Today, for every five pounds of resin sold, about one pound is an alloy or a blend [1]. In the United States, 1000 patents relating to alloys and blends are awarded every year; this is an equivalent of about three patents per day. Dated back from the 19th century to 1980, there were only a few polymer blends. The following is a selected chronology for the development of polymer blends.

1912 First polymer blend prepared

1933 First graft copolymer

1937 Styrene-butadiene rubber (SBR)

1948 First commercial polymer blend (HiPS)

1948 ABS polymers

1952 First block copolymer

1960 Segmented polyurethanes

1964 OsO_4 staining

1965 Thermoplastic elastomers

1.2 The Purpose of the Present Study

This research is aimed as an endevour to blend commercially available polymers. The proposed blend system is between Polyamide 6 (PA6) and HiPS. Properties of the PA6/HiPS blend systems will be investigated. To enhance compatibilization in this polymer blend system, it is necessary to have the third component which is compatible with both the polystyrene, which is the matrix in the HiPS, and the PA6.