CHAPTER II

LITERATURE REVIEW

2.1 History and Background

Immiscible blends are generally prefered over miscible blends because one can take advantages of the useful properties of each component in the blends. However the blends often have poor mechanical properties relate to their components and unstable morphology. Effective compatibility is the way to insure the successful commercialization of immiscible polymer blends.

In recent year the study in the blend of HDPE, high density poly ethylene, and PET, poly(ethylene terephthalate), has been the subject of much interest. Jabarin et al.[11, 1992] investigated the mechanical properties, rheological, melting, crystallization and morphological characteristics of HDPE/PET blend. A maleic anhydride grafted polyolefin was used as the compatibilizer. The blends with added compatibilizer showed good processability and good mechanical, physical appearance, rheological properties and good melt strength. The mechanical properties were found to be dependent on the composition and morphology of the blends. Sambaru et al.[19, 1992] studied blends of HDPE/PET at different ratios, compatibilized with a maleic anhydride grafted polyolefin. The mechanical properties were also measured and the morphology of the blends after stretching was examined. Stretching resulted in a fibrillar morphology and improvement of mechanical properties. Chen et al.[3, 1994] also studied the processability and thermal properties of various ratio of HDPE/PET blend. Ethyl vinyl acetate (EVA) was used as compatibilizer. Blends of HDPE/PET (50/50) showed the lowest equilibrium torque. When EVA was presented in the blends, the equilibrium torque was highest. Thermogravimetric analysis showed that the more PET components in the blends, the lower the final weight loss.

Dagli et al. [4, 1994] studied the effect of ethylene glycidyl methacrylate copolymer (EGMA) as a reactive compatibilizer in HDPE/PET blends. The ternary blend resulted in fine morphology and improved mechanical properties. The compatibilization process was affected by sequences and modes of component addition. Premixed HDPE with EGMA then mixed with PET resulted in better compatibilization.

Traugott et al.[20, 1983] also investigated the mechanical properties of HDPE/PET blends. Two types of compatibilizer were used. The first one was a tribock copolymer and the second one is elastomer. The results were disscused in term of phase morphology and interfacial adhesion among the components. The surface of the blends, which was added elastomer, showed the distinction of the phase, whereas such distinction was not clear for the triblock copolymer. Moreover, the ductility of the blends were greatly improved when triblock copolymer was added.

Kalfoglou et al.[13, 1994] studied the effectiveness of the compatibilizer, ionomer of poly (ethylene-co-methacrylic acid), for LLDPE and PET. The properties of the various LLDPE/PET ratios and ionomer were investigated. The results from optical and electron microscopy, dynamic mechanical spectroscopy, differential scanning calorimetry indicated a phase-separated system. Results from tensile tests characterized the mechanical compatibilization. The compatibilized blends showed the best properties when using moderate levels of compatibilizer. The interfacial bonding was strong at the PET/ionomer interphase. Muller et al.[17, 1987] studied the viscosity, thermal and mechanical properties of the virgin PET and post consumer PET bottles. Virgin PET exhibited a brittle behavior while post consumer PET bottles exhibited more ductile.

Young et al. [21, 1989] examined blends of PP/PET (60/40 by wt.) compatibilized by using an acrylic acid grafted PP. The fine morphology and improvement of processability were observed. The blends also had good mechanical properties. Akkapeddi et al.[2, 1995] examined the mechanical properties and morphology of reprocessed blends of HDPE/PET, compatibilized with EGMA. At 10% EGMA level showed the improvement in heat resistant and toughness of HDPE/PET blends. Favis et al.[5, 1987] examined the size of the minor phase in an immiscible blend of PP/PC during processing. Light and scanning electron microscopy were used to examine the size of minor phase in the blends. The size was examined as a function of both viscosity ratio and torque ratio. There are several studies in the degradation of reprocessed PET by differential scanning calorimetry, rheometer.[5,7,9, 1987,1994,1985]

There are no literatures about the effect of number of passes on the properties of HDPE/PET blends, PET was collected from post consumer bottles.

This experiment was designed to find out the effect of number of reprocessing cycles on the properties of the blends.

2.2 Objectives

1. To study the effect of the number of reprocessing on the properties of the HDPE/PET blends (binary blends and ternary blends)
2. To study the processability of the HDPE/PET blends
3. To study the probability to reprocessed the HDPE/PET blends