CHAPTER I

INTRODUCTION

It is also important to recall that macroscopic properties of polymers cannot be uniquely determined by average values. Determining, for instance, the molecular weight averages of a polymer sample is usually not sufficient to uniquely define the state of polymer sample by light scattering or with a more crude estimation from melt flow index (MFI) measured. Since polymers with the same average molecular weights can process other properties that differ markedly. Even a knowledge of the full molecular weight distribution may not be sufficient for many practical applications. Thus determining the average compositions of copolymers or the degrees of branching is necessary in order to accomplish in this work.

Temperature rising elution fractionation (TREF) is currently the best technique for obtaining a composition distribution for polymers. Detailed information about the molecular structure of polymers can be correlated to their macroscopic properties and therefore to their final application. TREF is a technique developed to separate semicrystalline polymers according to differences in molecular structure or composition. These molecular level differences lead to changes in crystallinity and solubility. TREF has been mainly applied to the characterization of polyalkene, especially polyethylene and its various copolymers. In polyethylene copolymers with alpha-alkenes, differences in crystallinities are caused by different amounts and distributions of preliminary short chain branching. TREF makes use of differences in molecular structure to fractionated polymer chains.

Basically, TREF can be divided into crystallization and elution stages. Cooling rates reported in the literature cover a range from 0.5°C/h to 10°C/h; however, most tend to be 5°C/h or lower. This time-consuming cooling step represents a drawback for the TREF technique [1-5]. In order to improve the crystallization rate the solvent strength

must be modified increased by mixing the hot xylene, a good solvent, with ethylene glycol or glycerol, a non-solvent. Both ethylene glycol and glycerol are more polar than xylene. Thus it was proposed that using mixed solvent in the crystallization (cooling) step was able to reduce crystallization time. Samples for this study are commercial-grade C_4-LLDPE, C_6-LLDPE and C_8-LLDPE.

1.1 The Objectives of Thesis

The purposes of research are as follows:

1. To optimize the condition of preparative TREF for separating polymer fraction (linear low density polyethylene).
2. To compare fractionating efficiency when using the single and mixed solvent in the crystallization step

1.2 Scope of the research

1. To prepare various condition of preparative TREF with single solvent system for finding the optimum condition of separated polymer fraction.
2. To find the mixed solvent system for reducing the analysis time of TREF .