CHAPTER I

INTRODUCTION

Nowadays the polymeric material can be considered to be one of the essential components in varieties of products, for example, household appliances, toys, electric and electronic equipments, automobiles. One of the most used polymeric materials is polyolefin. They - including polyethylene (PE), polypropylene (PP), poly(ethylene-propylene) elastomer (EPR), and ethylene-propylene-diene rubber (EPDM) - are the most widely used commercial polymer family. PP, one of the polyolefins, is widely used and greatly demanded in industry. From business information publishers, Gobi International, reports. The world polypropylene (PP) market is growing on average 3% a year, with world consumption forecast to rise to almost 33 million tones by 2005. Demand for polypropylene is greatest in Asia, accounting for 34% of world consumption [1].

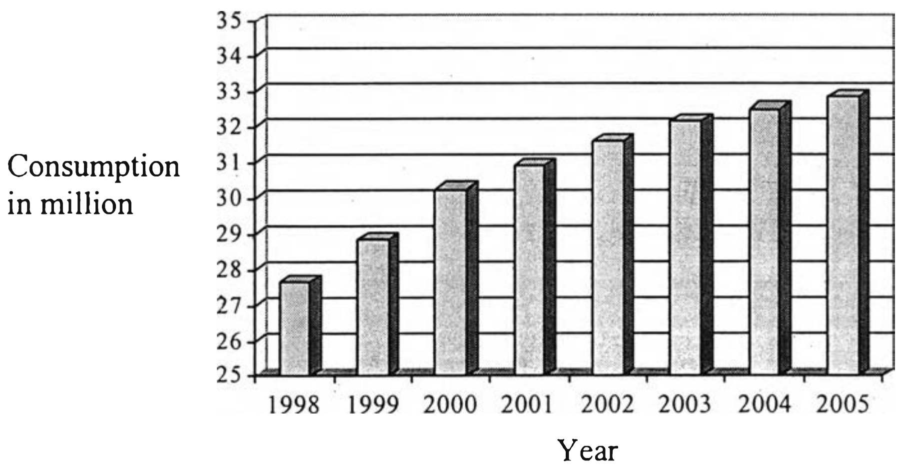

Figure 1.1 World consumption of polypropylene in 1998-2005

From various polymeric products, each product is requiring different physical, chemical, electrical, mechanical, and other properties from the polymer materials. The ability to improve these properties of the polymeric materials to meet the current and future demand is still the importance reach and development activities in both academic and industrial sectors.

Isotactic polypropylene (iPP) is a typical semi-crystalline polymer with crystalline part and amorphous part. iPP resins have been extensively used in various products such as automotive parts, furniture and containers. However, the application of iPP as an engineering plastic is limited owing to its poor toughness in particular at the lower temperatures range. So far the toughness of iPP at lower temperatures has been improved by blending various rubbery materials [2–9] such as ethylene-propylene (EP) copolymer or EPR, ethylene-1-hexene (EH) copolymer and ethylene-propylene-diene terpolymer (EPDM).

In particular, binary blends of iPP and EPR copolymers have been extensively investigated from the commercial point of view. Although the control of compatibility plays an important role in modification of mechanical properties of the iPP/EPR blend systems, the strong incompatibility in EPR and iPP blends limits the modifications of morphology and mechanical properties [10].

In this research, polypropylene-co-poly(ethylene-propylene) copolymer poly(P-*co*-EP) will be used modifier for iPP. poly(P-*co*-EP) will be investigated using the Ziegler-Natta catalyst. The addition of the EP copolymers is expected to be a powerful tool for the modification of mechanical properties of iPP and to make it possible to produce a new type of iPP-based thermoplastics.

1.1 The Objectives of This Thesis

To synthesize ethylene propylene rubber co polypropylene, in order to serve as toughening agent.

1.2 The Scope of This Thesis

1.2.1 Synthesize Ziegler-Natta catalyst

1.2.2 Synthesize poly(P-*co*-EP) by using Ziegler-Natta catalytic system.

1.2.3 Blend poly(P-*co*-EP) with polypropylene.

1.2.4 Characterize properties of polymer obtained with NMR, GPC, DSC, tensile, and DMA.

This thesis is divided into five chapters as follows:

Chapter I provide an overview of the polypropylene and objective and scope of this thesis

Chapter II presents literature reviews of the previous works related to this research.

Chapter III explains the basic theory about this work such as Ziegler-Natta catalytic system, polypropylene characteristic, type of copolymer, ethylene-propylene copolymer and reinforced polymer.

Chapter IV shows the experimental equipments and experimental procedures to synthesis copolymer between propylene and ethylene-propylene copolymer and blending of polymer. Including, instruments and techniques used for characterizing the resulting polymers.

Chapter V exhibits the experimental results on poly(P-*co*-EP) and effect of poly(P-*co*-EP) in reinforcement of polypropylene.

Chapter VI, the last chapter, shows overall conclusions of this research and recommendations for future research.