CHAPTER I

INTRODUCTION

The establishment of the petrochemical complex in Thailand has driven Thailand toward a new era of economic growth and industrial expansion. The large expansion in the petrochemical industry calls for sophisticated new technology, much of which can be based on catalysis. Propylene polymerization can be regarded as one of the major technological and commercial triumphs in the petrochemical field[1]. As is known, the Ziegler-Natta catalysts are the most widely used in the polymerization of propylene. The Ziegler-Natta catalyst is a mixture of a metal alkyl of base metal alkyl of groups I to III and a transition metal salt of metal of groups IV to VIII [2]. The specific nature of these catalysts has an important effect on the kinetic of polymerization and thenceforth, the molecular weight, molecular weight distribution, copolymerization, compositions and degrees of stereoregularity of the polymer products[3].

Although Ziegler-Natta catalysts have been investigated for a long time since their discovery in the mid-1950's and much attention was directed toward improvements in catalyst productivity, there has been and continues to be much active research on other important features of polymerization. While significant technological advances based on new and improved catalysts have been made, the understanding of the Ziegler-Natta catalysts is still deficient. It is true that propylene catalytic processes are not generally understood in a detailed mechanistic sense. Nevertheless, the study of propylene polymerization by Ziegler-Natta catalyst with third components used as electron donor was set up to overcome that weak point. The more understanding of characteristics of the catalytic polymerization there is the more utilization of the Ziegler-Natta catalysts and their monomers we gain. Moreover, the development of domestic technology is expected to be possible.

1.1 THE OBJECTIVES OF THE THESIS

1.1.1. To study techniques and steps of propylene polymerization by Ziegler-Natta catalyst. It is a basic principle for anyone who takes part in this field. The techniques and steps of polymerization are concerned not only the chemistry, but also kinetics, and a number of effects on catalytic polymerization.

1.1.2. To determine suitable condition for propylene polymerization by classical Ziegler-Natta catalyst system. The classical Ziegler-Natta catalyst system is an original catalyst of almost all industrial polymerization catalysts used nowadays. It is completely right for the beginners to clarify the wondrous working mechanism of these catalysts with the classical system.

1.1.3. To study the effects of an external electron donor on classical Ziegler-Natta catalyst system. The studied effects are on the activity and physical properties of the produced polypropylene. The external electron donor together with proper catalyst system can increase or decrease activity of propylene polymerization. The external electron donor together with proper catalyst system can also increase isotactic contents in polypropylene product. The isotactic polypropylene is the most desired form in many useful application.

1.1.4. To characterize polypropylene produced in the experiment. Scanning Electron Microscope technique is the effective method to investigate the mophology of polypropylene product. The term of morphology is referred to the shape, size, and texture or form of polypropylene.

1.2. THE SCOPE OF THE THESIS

1.2.1. Study the effect of catalyst ratio(Al/Ti) on the catalytic activity by varying the concentration of triethylaluminum in the presence of constant titanium tetrachloride concentration.

1.2.2. Study the effect of propylene to hydrogen ratio on the catalytic activity at constant total pressure.

1.2.3. Study the effect of total pressure on the catalytic activity.

1.2.4. Study the effect of polymerization temperature on the catalytic activity of propylene polymerization.

1.2.5. Study the effect of external electron donors on the catalytic activity and percent weight insoluble of polypropylene in boiling heptane.

This thesis is divided into 6 chapters. The reason for selective "Effect of an external electron donor on polypropylene synthesis" as the subject of this thesis, the important role of isotactic polypropylene plays in the plastic industry, the objectives and the scope of the thesis were described in Chapter 1. Brief summarization of some other articles and patents covering investigations of olefin polymerization were available in Chapter 2. General consideration of chemistry of Ziegler-Natta catalyst, approached models of active species formation, some effects on catalytic activity, and some aspects of catalytic behavior were mentioned in Chapter 3. The concepts of polymerization, kinetics, mechanisms, and factors that control polymer properties are also included. In Chapter 4 the details about chemicals, equipment, procedures, characterization methods used in this thesis were shown. Result and Discussion of this study were shown in Chapter 5. Conclusion and some recommendations were given in Chapter 6.