

CHAPTER I

INTRODUCTION

The discovery of abundant supplies of natural gas in the Gulf of Thailand during the mid-seventies led to the vast development of gas utilization as well as petrochemical industries. The first natural gas processing plant located at Map Ta Phut in the Rayong province operated in 1985. The plant is capable of extracting maximum ethane from the gas feed for supply to the nearby ethane cracker of the first petrochemical complex.

Although downstream industries have been relatively well established, several of them are still dependent on imported feed stocks. The one upstream, the National Petrochemical Public Company Limited is in operation supplying ethylene and propylene from the ethane cracker-propane dehydrogenation complex. The second upstream company, Thai Olefins Co., Ltd., with a naphtha cracker produces ethylene and propylene. Ethylene and Propylene are importantly used in production plastics such as polyethylene, polypropylene.

Ethylene polymerization can be regarded as one of the major technological and commercial triumphs in the petrochemical field. As known, the Ziegler - Natta catalyst is most widely used in the polymerization of ethylene. Soluble homogeneous Ziegler - Natta catalyst is an important class of catalyst for olefins polymerization. Although vanadium-based catalysts (e.g. VCl_4 , $VOCl_3$) have long been used in the industry for solution polymerization of ethylene and dienes. It is only recently that extremely active soluble Ziegler-

Natta catalysts have been discovered, notably by Kaminsky and co-workers in Germany. It is now well known titanocene and zirconocene compounds form very active soluble Ziegler - Natta catalysts when they are used in conjunction with methyl aluminoxane as a cocatalyst.

While significant technological advances based on new and improved catalysts have been made, the understanding of the Ziegler - Natta catalyst is still deficient. It is true that ethylene catalytic processes are not generation understood in detailed mechanism. Nevertheless, the more study understanding of characteristics of the catalytic polymerization there is the more utilization of the Ziegler - Natta catalyst, the molecular weight, molecular weight distribution we gain. More, the development of domestic technology is possible.

1.1 THE OBJECTIVES OF THE THESIS

1.1.1 To investigate techniques and step of ethylene polymerization by homogeneous Ziegler - Natta catalyst. It is a basic principle for one who takes part in this field. The techniques and steps of polymerization are concern not only the chemistry, but also kinetics, and a number of effects on catalytic polymerization.

1.1.2 To find out suitable condition for ethylene polymerization by homogeneous Ziegler - Natta catalyst. It is completely right for the beginners to clarify the marvelous working mechanism of this catalyst.

1.1.3 To observe the effects of homogeneous Ziegler - Natta catalyst. The studied effects are for the rate of polymerization, activity, and physical properties of the polymer.

1.1.4 To characterize polymer which obtained from homogeneous Ziegler - Natta catalyst

1.2 THE SCOPE OF THE THESIS

1.2.1 Preparing the techniques and procedures to prepare the homogeneous Ziegler - Natta catalyst and the suitable condition to prepare it was applied to polymerize ethylene at particular condition.

1.2.2 Verifying the effect of catalyst ratio on rate of polymerization and catalytic activity by varying the ratio of catalyst.

1.2.3 Examining the effect of pressure on rate of polymerization and catalytic activity by varying the pressure 10 - 40 psi.

1.2.4 Examining the effect of temperature on rate of polymerization and catalytic activity by varying the temperature 0 - 80 °C.

This thesis is consisted of 6 chapters. The introduction and the objective of the thesis and the scope of the thesis are described in Chapter I. The related publication of articles and patents are summarized in Chapter II. General considerations of chemistry of Ziegler- Natta catalyst, models of actives species formation and some aspects of catalytic behavior are mentioned in Chapter III. And the concepts of polymerization, kinetics,

mechanisms, and factors that control polymer properties are also included. In Chapter IV, the details about chemicals, equipment, procedures, characterization methods used in this thesis is shown. Result and discussion are reported in Chapter V and conclusion with recommendation are given in Chapter VI.