

CHAPTER I

INTRODUCTION



The establishment of the petrochemical complex has driven Thailand toward a new era of economic growth. The large expansion in the petrochemical industry calls for sophisticated new technology, especially polymerization catalysis technology. Propylene polymerization is one of the major technology in the petrochemical field[1]. As widely 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 [2,3]. However, without modifiers, obtained polypropylene had low amount of isotactic structure that was most required by plastic industries because of its advantages in physical properties as shown in Table 1.1. Thus, electron donors were introduced as catalyst modifiers [4-13] for increasing stereospecificity. However, it lowered catalyst activity[7,8,11].

Table 1.1 Physical properties of isotactic, syndiotactic, atactic polypropylene [1]

Properties	Isotactic Polypropylene	Syndiotactic Polypropylene	Atactic Polypropylene
Density (g/cm^3)	0.92-0.94	0.89-0.91	0.85-0.90
Solubility in hydrocarbon solvent at 20 °C	-	Medium	High
Yield Strength	High	Medium	Low

This thesis was carried out to study the effect of internal and external donors in propylene polymerization. Using diethyl phthalate as internal electron donor and five alkylalkoxysilane compounds at various amounts of ethoxy and hydrocarbon groups, tetraethoxysilane (TES), methyltriethoxysilane (MTES), dimethyldiethoxysilane (DMDES), trimethylethoxysilane (TMES), and phenyltriethoxysilane (PTES) were used as external electron donors in this research.

1.1 THE OBJECTIVE OF THE THESIS

To study the effects of internal and external electron donors on propylene polymerization by using supported Ziegler-Natta catalyst system.

1.2. THE SCOPE OF THE THESIS

1.2.1. Study the preparation of $MgCl_2$ supported Ziegler-Natta catalyst by alcohol adduct and apply to slurry polymerization process.

1.2.2. Study the effect of internal and external electron donors on properties of obtained polypropylene by using the catalyst molar ratio Al/Ti at 167, the pressure of propylene at 100 psi, polymerization temperature at 90 °C, polymerization time of 90 minutes, and the molar ratio of external electron donor to aluminium is 0.05 in 2 litres reactor.

Internal electron donor used is diethyl phthalate and at least five silane compounds such as TES, MTES, DMDES, TMES, and PTES were used as external electron donors.

1.2.3. Determine the properties of polymer obtained from this catalyst.

This thesis is divided into 6 chapters. The objective 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. Results and Discussion of this study were shown in Chapter 5. Conclusion and some recommendations were given in Chapter 6.



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