

# CHAPTER I

## INTRODUCTION

In high density polyethylene (HDPE) production, broad molecular weight distribution (MWD) of HDPE is performed by two ways. First way is process development; for example, two reactors are used in different molecular weight HDPE production. High molecular weight HDPE is produced in first reactor while low molecular weight is produced in second reactor<sup>[1]</sup> and a powder formed HDPE are obtained. The dry blend of HDPE powder is made up for broadening MWD of HDPE. However, this method led to two most important problems in commercial scale such as hard process control and uncertain physical properties of HDPE that came from their inhomogeneity. Second way is catalyst development. There are several ways to develop catalyst such as mixing of Phillip catalyst which is prepared from different pore volume silica<sup>[2]</sup>, mixing of chromium catalyst with titanium catalyst<sup>[3]</sup>, gel like diethoxymagnesium for Zeigler-Natta (Z/N) catalyst preparation<sup>[4]</sup> and etc. However, mixing of catalyst is not limited only in Phillip and Z/N catalyst. There are many literatures that study on mixing of Z/N catalyst with metallocene<sup>[5,6]</sup>.

From previous research, broad MWD of HDPE was prepared by various methods that depended on each process efficiency and particularly. The development of Z/N catalyst by using origin process is interested, while the process changed led to high cost and risk of operation.

## Objective

The purpose of the study is to prepare broad MWD polyethylene by using mixed catalyst, which was prepared in different conditions.

## Scope of the Investigation

Scope of this study is made broad MWD polyethylene by using mixed catalyst, which was prepared in different conditions, are as follows:

1. Literature survey of the relevant research works
2. Preliminary study of Z/N catalyst preparation and effect of Z/N catalyst characteristic on ethylene polymerization and polyethylene.
3. Preparations of Z/N catalyst based on  $\text{Mg}(\text{OC}_2\text{H}_5)_2$  and  $\text{TiCl}_4$  raw material are as follows:
  - 3.1. Preparation of Z/N catalyst synthesis for producing low molecular weight HDPE
  - 3.2. Preparation of Z/N catalyst synthesis for producing high molecular weight HDPE
  - 3.3. Mixing of Z/N catalyst for producing broad MWD polyethylene
4. Analysis of Z/N catalyst such as Mg, Ti, and Cl mole ratio, total-Ti and Ti(III) concentration
5. Polymerization of ethylene by using Z/N catalyst from 3.1, 3.2 and 3.3
6. Analyses of HDPE as melt flow index (MFI), molecular weight by weight (Mw) and molecular weight distribution (MWD)