CHAPTER I
INTRODUCTION

Normally, flue gas released into the atmosphere from most industries, including the petrochemical industry, contains approximately 80 % N_2, 15 % CO_2, and 5 % O_2, as well as 500 ppm SO_2, 100 ppm CO, and 50 ppm CH_4. These gases produced by combustion of fossil fuels are regarded as greenhouse gases. Among them, CO_2 has the most adverse impact and causes approximately 55 % of the currently observed global warming. The increasingly accumulated CO_2 in the atmosphere has become a worldwide concerned problem. Therefore, people around the world need to protect the environment and slow down the climate change by reducing emission of CO_2 (Zhang *et al.*, 2008).

To reduce greenhouse gas emission, CO_2 separation and capture technologies are of growing importance. There are four main widely used commercial CO_2 removal processes. They are absorption, adsorption, membrane, and cryogenic processes. However, the most important commercially applied technology for CO_2 removal is the absorption process, which can also be called extraction process, by using a liquid solvent.

Liquid solvents used in CO_2 absorption can be divided into two categories: chemical and physical solvents. The processes using amine-based solutions, such as alkanolamines, that chemically react with dissolved CO_2 are commonly used to enhance the CO_2 absorption rate and CO_2 loading capacity. Monoethanolamine (MEA), diethanolamine (DEA), and methyldiethanolamine (MDEA) are some of important amines, which are widely used. However, the conventional primary and secondary alkanolamines exhibit a relatively low maximum loading capacity for CO_2 capture. Recently, sterically hindered amines and diamine have been introduced as new commercially attractive solvents over the above mentioned conventional amines because of their advantages in high CO2 loading capacity, high degradation resistance, and low regeneration energy (Saha *et al.*,1999). Nowadays, the use of blends of alkanolamines, i.e. a solution of two or more amines with various compositions, is very interesting because it combines the desired characteristics of different solvents while suppressing their unfavorable characteristics (Choi *et al.*, 2009).

The purposes of this research were to investigate hybrid solvents blended between MEA and various types of sterically hindered amines and diamine, and to optimize the blending ratio in order to obtain an enhanced CO_2 absorption rate and CO_2 loading capacity from flue gas.