CHAPTER I
INTRODUCTION

Nowadays, the global climate change is a big problem for worldwide environment. Rising of the global surface temperature is attributed to an increase of Carbon Dioxide (CO_2) levels in the atmosphere. CO_2 is one of the common greenhouse gases and it is the most influence on global climate change because almost all of the human activities release CO_2. Moreover, the tendency of the CO_2 emission is increasing every year.

The combustion of fossil fuels by the industries is rapidly increasing the emission of CO_2 in the atmosphere. In 2010, 43.1% of CO_2 emission or approximately 12,000 metric ton of CO_2 equivalent was generated from the burning of fossil fuel (IEA, 2012). Recently, many countries are concerning about the environmental impact and considering the best technology to control the emission of CO_2.

There are a wide range of technologies currently exist for capture and sequestration of CO_2 emission from flue gases including absorption, adsorption, cryogenic separation and membrane based on the different physical and chemical processes. Because absorption, cryogenic separation and membrane have some drawbacks. Adsorption process is, therefore, considered to be the effective promising technologies to capture CO_2. To reach the high performance of the adsorption, the ability of the adsorbent is an important factor.

To improve the surface properties of the adsorbent, different procedures are employed. A number of researches focused on the introduction of nitrogen functional groups on the surface of adsorbent due to the role of CO_2 as a weak Lewis acid, it is attractive to Lewis base (Arenillas *et al.*, 2005, Maroto-Valer *et al.*, 2005, Xu *et al.*, 2003). The popular ways used for the preparation activated carbon is to remove or neutralize the acidic functionalities and to replace acidic groups with proper basic groups (Shafeeyan *et al.*, 2010). Nitrogen containing functionalities can be introduced through the impregnation with amine compounds or treatment with ammonia. However, nitrogen functionalities are not the only species capable of acting as Lewis bases. Electron-donating of oxygen atom that found in oxygen functional groups can react with CO_2 through electrostatic interactions (Plaza *et al.*, 2013).

The purpose of this research was focused on the use of adsorbent derived from activated carbon. Several treatments were applied to improve the chemical properties of the surface of activated carbon such as oxidative treatment, impregnation and oxidative treatment followed by impregnation with some amine compounds that can improve the affinity for CO_2 onto the adsorbent. The effects of each surface treatment steps will be studied to understand differences in surface properties and to determine the adsorption/desorption performance by a gravimetric method.