CHAPTER I
INTRODUCTION

Carbon dioxide is the main component of greenhouse gases among others due to its abundance, which is produced not only from burning fossil fuels, coal, oil, natural gases, but also from the industrial sources, such as chemicals and petrochemical manufacturing.

Exploration of effective methods to stabilize the global atmospheric concentration of CO_2 is an urgent task. Surrounding by different strategies proposed for CO_2 mitigation, carbon capture and storage (CCS) is recognized as a major technology to reduce the global emission of anthropogenic CO_2. There are various CO_2 capture technologies, such as cryogenic techniques, membrane purification, absorption phenomena in liquid solution and solid adsorption. Among these technologies, solid adsorption processes are suggested to be a promising way that avoids equipment corrosion, large equipment size, high energy cost in regeneration encountered by chemical absorption.

There are numerous materials investigating CO_2 adsorption; for example, zeolites, activated carbons, metal-organic frame (MOF) materials, metal oxide and amine modified porous silica. Among these adsorbents, amine content of mesoporous silica is found to be received interest due to their high adsorption capacity and selectivity towards CO_2 (Li *et al.*, 2013).

There are a wide variety of alkanolamines, such as monoethanolamine (MEA), diethanolamine (DEA), methyldiethanolamine (MDEA), piperazine, etc. These amines have been used in determining the performance of the impregnated solid sorbent. Previous work studied on the CO_2 adsorption using activated carbon modified with piperazine (Kangwanwatana *et al.*, 2013). In this work, the mesopore silica adsorbent will be impregnated with piperazine to improve the adsorption capacity as compared to the activated carbon. In order to utilize the full surface of the adsorbent with maximum loading for maximum adsorption capacity, it was recommended to choose a wider pore adsorbent to reduce the pore blockage. This study chooses silica gel and activated carbon to be the adsorbents.