

CHAPTER I INTRODUCTION

The consumption of natural gas as a vehicular fuel has continuously increased due to cheaper cost than other fossil-based fuels, high octane number, and the compatibility to be used in the existing internal combustion engine. Furthermore, from the environmental point of view, the natural gas can be completely combusted, emitting low pollution—dust, particulate, and smoke.

Typically, during transportation, natural gas can be stored by three methods which are LNG (Liquefied Natural Gas), CNG (Compressed Natural Gas) and ANG (Adsorbed Natural Gas). CNG is currently being implemented as the mean to store natural on vehicle in Thailand. The natural gas contains methane as the major component and cannot be stored with the energy density as high as gasoline (11 MJ/L for CNG at 24.8 MPa compared with 32 MJ/L for gasoline). Therefore, the CNG vehicle is required to re-fuel more often. To increase the amount of natural gas storage, the use of adsorbent is suggested. Due to their high surface area, the porous materials, such as activated carbon and Metal Organic Frameworks (MOFs) are promising adsorbents for this application. Many studies have reported the methane adsorption on activated carbon derived from renewable materials such as corn cob (Bagheri et al.,2011; El-Hendawy et al.,2001), bagasse (Kalderis et al.,2008) ,coal (Guo-zhuo et al.,2009; Krooss et al.,2002), coconut shell (Azevedo et al., 2007; Prauchener et al.,2008; Wei et al., 2008), oil palm shell (Arami-Niya et al.,2011), rice husk (Balathanigaimani et al., 2006; Chen et al., 2011; Kalderis et al.,2008), and eucalyptus (Tancredi et al., 1996). It has been suggested that the amount of methane uptake strongly depends on the physical of activated carbon such as BET surface area, micropore volume, packing density and pore size distribution (Salehi et al., 2007; Lozano et al., 2002).

The purpose of this study is to investigate methane adsorption on MOFs and activated carbons. Basolite C300 and Basolite Z1200 are the commercial MOFs used in this investigation. Activated carbons are those derived from indigenous sources including coconut shell, and eucalyptus, and those derived from coal. In this study, the experiments were done by volumetric method at various temperature (303, 308,

and 313 K) and the pressure up to 900 psia. The adsorption isotherm models are also studied.