

CHAPTER I

INTRODUCTION

Nowadays, the environmental issues are concerned because the rapidly increasing in the earth's average temperature is one of the major important that caused by the pollution of traditional plastic wastes release toxic gaseous and greenhouse gas (GHG) emissions. The emission of greenhouse gas includes carbon dioxide (CO_2) and methane (CH_4) into the atmosphere impacted on the global warming. Besides, CO_2 is an acidic gas which can corrode the pipeline in the natural gas processing and reduce energy content of natural gas (Li, *et al.*, 2010).

The preparation of materials which are environmental friendly, non-toxic and or bio-sourced will be concerned due to environmental conservation by using the organic-inorganic hybrid composites which are the combination of at least two components which can be designed to have higher performance and better properties than the conventional materials with insufficient properties and cost reduction. Moreover, most of all the mixtures are the combination of organic and inorganic in which the inorganic part act as a filler providing mechanical strength while the organic part as a matrix (Kickelbick, *et al.*, 2007). Polyvinyl alcohol (PVA) is an environmental synthetic polymer, non-toxic material, water soluble and biocompatible. For improving mechanical and thermal characteristics, polyvinyl alcohol-clay composite is interesting (Ali, *et al.*, 2012). In addition, calcium carbonate (CaCO_3) is the third most abundant material on earth which is the composite of limestone which can be used to produce filler or pigment in large quantities for the manufacturing of plastics, rubbers, coating, textiles and paper industries. Calcium carbonate has low cost and can be used to enhance the mechanical properties (Zheng, *et al.*, 2008 and Houmard, *et al.*, 2009).

In order to reduce CO_2 concentration, the separation of CO_2 from CH_4 can be also increase high-purity product and prevent the pipeline corrosion with membrane separation technique due to using low cost materials, low energy consumption, and safety environment (Sridhar, *et al.*, 2007). For gas separation, it can be divided into polymeric membrane, ceramic membrane and composite membrane (Abedini, *et al.*, 2010). Moreover, a membrane can be classified into

porous and non-porous membranes. Porous membranes have advantages for high permeation of a permeate through the membrane but low selectivity (Zhang., 2010)

In this study, the preparation of green porous hybrid composite from polyvinyl alcohol (PVA) as a matrix combined with calcium carbonate (CaCO_3) used as a filler and cross-linking used boric acid, which are fabricated by using a freeze-drying method in order to use for gas separation based on the porous composite properties has been investigated.