CHAPTER I
INTRODUCTION

Carbon dioxide (CO_2) and methane (CH_4) are the important component in flue gas which is generally produced by the combustion of fossil fuels in the industrial processes. CO_2 emissions are concerned because it makes global climate change, commonly known as "greenhouse effect" (Xu X. *et al.*, 2005). Therefore, CO_2/CH_4 separation is developed.

There are several post-combustion and capture technologies being investigated such as absorption, adsorption, cryogenic separation and membrane separation (Tirzha L.P. Dantas *et al.*, 2012). Traditional methods for CO_2 capture are based on reversible absorption such as amine scrubbing and cryogenic technologies, but these processes are costly and energy intensive. The membrane technology is attractive for CO_2 separation. The advantages of membrane gas separation over traditional techniques are low-energy consumption, ease of operation, and low environmental impact (Iarikov D. *et al.*, 2012).

Organic polymers are the most widely used as membranes for gas separation such as polyimide, cellulose acetate and polysulfone (Abetz V. *et al.*, 2006). However, using polymer as membranes in CO_2/CH_4 separations has been concerned since the membrane selectivity can be reduced because of CO_2-induced plasticization (Bos A. *et al.*, 1998; Scholes C. A. *et al.*, 2010; Wessling M. *et al.*, 1991). But the effect of CO_2-induced plasticization can be significantly improved by silver ionic modification approach. Moreover, the insertion of transition metal such as silver into the polymer membrane can be used to increase the selectivity (Li Y. and Chung T. S., 2010), since silver ions can react reversibly and selectively with CO_2 by π-complexation formation mechanism (Li, Y. *et al.*, 2007)

In this study, polybenzoxazine, which has many excellent properties such as high porosity, high heat resistance and excellent dimensional stability (Liu *et al.*, 2004) was incorporated with silver ions and used as the membrane for CO_2/CH_4 gas separation.