CHAPTER I
INTRODUCTION

Unsaturated hydrocarbons such as ethylene and propylene are important in chemical industries because they are starting materials in lots of chemical syntheses. The separation of unsaturated hydrocarbons is one of the most important processes in the petrochemical industry, for example, the recovery of ethylene in product stream in polyolefin plants. Olefin/paraffin separation processes in the petroleum and petrochemical industries, cryogenic distillation, are highly energy-intensive and require high capital costs since the close boiling points of olefins and their paraffins counterparts. Polymeric gas separation membrane has played an important role as an alternative method for olefin/paraffin separation (Jacob *et al.* ,1999).

Membrane separation processes, known for their compactness, simple and efficient operation, and low energy consumption, can be employed effectively in olefin/paraffin separations (Eldridge, 1993). Membrane-based gas separations have been used commercially in various applications: the production of nitrogen enriched air for inert gas blanketing applications, CO_2 removal in natural gas treatment, hydrogen recovery during industrial process operations, SO_2 removal from gas streams, H_2S and water removal from natural gas and separations of hydrocarbons and fluorocarbons from air (Rousseau, 1987). However, most membranes utilized for gas separations have a trade off relation, that is, membranes which have high selectivity cannot provide permeability, and vice versa (Freeman, 1999). Later, there were attempts to improve membrane permselecitvity. The Leob-type membranes composed of a thin dense semi-permeable skin and a less dense, non-selective porous support were found to have improvement in permeation rate due to the decrease in thickness of the dense selective region (Pinnau *et al.*, 1988).

Further development of membranes was multicomponent membranes, of which each component provides suitable properties for separations. The multicomponent membranes composed of a plasticizer and an organic polymer deposited on highly porous support were found to increase selectivity for certain gases separation. Mixed matrix composite membranes prepared by incorporating molecular sieves such as zeolites or carbon molecular sieves, in polymer matrices can also improve membrane performance (Koros and Mahajan, 2000).

Another attempt to develop olefin/paraffin separation membranes is facilitated-transport membranes. The metal-ion-facilitated membranes enhance separation of olefin from paraffin via the reversible complexation reaction between the metal present in polymer matrix and the olefin (Petropoulous, 1990).

In the present work, mixed matrix membranes composed of silicone rubber and various kinds of glycol plasticizers casting on porous polysulfone support will be prepared. The effects of added glycol plasticizers on the olefin separation have been investigated through the permeability of propylene and propane. The results will be used to evaluate olefin/paraffin selectivity. Then, the plasticizers that enhance olefin/paraffin selecitvity will be identified. Futhermore, an attempt to use NaX zeolite for stabilizing PEG and the effect on olefin separation will also be studied.