CHAPTER I
INTRODUCTION

Petrochemistry of xylenes undergoes a strong economic development as a result of the increasing use of *p*-xylene. *p*-xylene is a precursor of purified tertphthalic acid (PTA), which is directly used to produce an essential polyester : poly (ethylene terephthalate) (PET) (Tournier *et al.*, 2001). *p*-xylene is usually present with other C_8 aromatics, *o*-xylene, *m*-xylene and ethylbenzene. Thus, separation of *p*-xylene from the C_8 aromatics is one of the classical separation problems in the petrochemical industry.

There are some limitations in the separation due to the similar physical properties of the C_8 isomers. For example, their close boiling points make the separation by distillation impractical and uneconomical. Moreover, crystallization may suffer from the eutectic problem. Nevertheless, the most attractive industrial technique for the separation of *p*-xylene is selective adsorption with zeolites (Tournier, 2001). The separation is generally performed by adsorption in the liquid phase, using a simulated moving bed technology. One of the most successful commercial processes is the Parex ^{TM} process by UOP LLC. KY and KBaX zeolites are used in this process as adsorbents with toluene as a desorbent (Varanyanond, 2001).

A thorough understanding of parameters that influence the effectiveness of separation is needed in order to achieve the best separation. There are many factors that control efficiency of *p*-xylene separation such as Si/Al ratio, exchanged cation, water content of zeolites, xylene coverage, composition of xylene adsorbed. In the industrial process, the feed is a mixture of desorbent and C_8 isomers, which is multi-component adsorption, and the process is operated in liquid phase. Although attempts have been made for more understanding of C_8 aromatics adsorption, experimental data have been for one or two component adsorption in the gas phase without the presence of a desorbent as used in the industrial process (Lachet, 1999). As a result, more understanding of the liquid phase adsorption of C_8 isomers and desorbent is needed.

This work deals with the study of liquid phase adsorption of C_8 aromatics in the presence of toluene as a desorbent on a series of di-valence cation exchanged 2.0X, 2.5X and Y zeolites at a constant pressure. To study the adsorption mechanism, the effects of zeolite acidity and cation size were taken into consideration. The effects of zeolite acidity on adsorption were investigated by varying the Si/Al ratio and exchangeable cation. And by changing the exchanged cation, the effects of cation size can be seen. Experiments were carried out using both, Pulse Test Technique at low feed concentration, and Breakthrough Technique with high feed concentration.