



CHAPTER I INTRODUCTION

C_8 aromatics, *p*-xylene, *m*-xylene, *o*-xylene and ethylbenzene, are ones of the most important raw materials in petrochemical industries. Among those four isomers, *p*-xylene is considered to be the most important one as it is the raw material in the production of purified terephthalic acid for polyester. In order to utilize each isomer efficiently, separation processes are needed.

Even though several separation processes exist, physical properties of the C_8 aromatics has ruled out some of the processes. For example, their close boiling points make distillation ineffective and uneconomical (Boutin *et al.*, 1998). Moreover, the crystallization process may suffer from the eutectic problem. Nowadays, selective adsorption with the use of zeolites is generally considered to be the most economical among the industrial processes. One of the most successful commercial processes is the ParexTM process by the UOP LLC. *KY* and *KBaX* zeolites are used in this process as adsorbents with toluene as a desorbent and the process operates in liquid phase.

The selective adsorption process is very successful and widely used for the C_8 aromatics separation but the understanding in the adsorption mechanism is still obscure. Many studies have been accomplished on the C_8 aromatics adsorption in order to shed some light on the adsorption mechanism (Bellat *et al.*, 1995, Barthomeuf and Mallmann, 1990, Iwayama *et al.*, 1995, Varanyanond, 2001). The studies found that *p*-xylene selectivity is affected by many factors such as SiO_2/Al_2O_3 ratio, exchanged cations, and water content of zeolites. These factors can be related to acidity of zeolites. However, most of the studies were conducted extensively on one or two components in vapor phase while the feed in real processes consists more than one component and the processes are operated in liquid phase. Consequently, a thorough study on the acid-base interaction of the multi-component of C_8 aromatics adsorption on zeolites in liquid phase is needed.

In the present work, the adsorption of the C₈ aromatics on *X* and *Y* zeolites was investigated with the focus on the relation between C₈ aromatics and zeolite acidity. The zeolite acidity was varied by ion exchanging the zeolites with the monovalence series of cations.