CHAPTER I
INTRODUCTION

Polyesters are considered to be the most important synthetic fiber raw materials. In the polyester production process, *p*-xylene is a precursor of purified terephthalic acid (PTA), which is directly used to produce polyesters. However, *p*-xylene is usually present in small amounts with other C_8 aromatics like *o*-xylene, *m*-xylene and ethylbenzene. Separation of the xylene from the C_8 aromatics is not an easy task because of their similar physical properties. For example, their close boiling points make the separation by distillation impractical and uneconomical. Nevertheless, over the years, an adsorption process has been chosen as a means to separate the xylene from the aromatics, in part, because adsorbents can be tailor made to specifically adsorb a desired component (Kulprathipanja, 1996).

Selective adsorption by using a zeolitic adsorbent is generally considered to be the most economical among the industrial processes for separation of the C_8 aromatics. An example of the selective adsorption processes is the Parex process by UOP. The process uses *X* or *Y* zeolite as an adsorbent and is operated in the liquid phase. In the process, toluene is used as the desorbent with *KY* or *KBaX* zeolite as an adsorbent. This proved to be a satisfactory combination for *p*-xylene recovery because toluene has the required adsorption affinity, and it is less strongly adsorbed than *p*-xylene but more strongly adsorbed than *o*-xylene, *m*-xylene and ethylbenzene (Kulprathipanja, 1995 and Smolin and Fishkill, 1982).

Because the adsorbate and desorbent are present at the same time, it is, therefore, essential to consider adsorptions of adsorbate and desorbent on an adsorbent rather than adsorptions of individual adsorbate and desorbent. However, there are very few experimental data available for the adsorptions of

adsorbate and desorbent on an adsorbent. Furthermore, almost all available data have been taken in the gas phase, which does not represent what happens in the real C_8-aromatic separation process. This is, in part, because of difficulties in doing experiment with the liquid phase.

In this work, liquid-phase adsorption of three isomers of the C_8 aromatics (*p*-xylene, *o*-xylene and *m*-xylene) and ethylbenzene with toluene as a desorbent on *KBaX* and *KY* zeolites were studied. Effects of initial concentration and temperature on the adsorption of each C_8 aromatics on the zeolites were the primary focus of the present work.