# CHAPTER I
# INTRODUCTION

Chloronitrobenzenes (CNBs) are important starting organic materials for manufacture of azo and sulfur dyes and extensively used in the synthesis of pesticides, fungicides, pharmaceuticals, preservatives, photochemicals and rubber chemicals. Generally, CNBs are prepared by either nitrification of chlorobenzene (CB) or chlorination of nitrobenzene (NB). The former gives a mixture consisting of approximately 60–65% of *p*-CNB, 34–39% of *o*-CNB and a small amount of *m*-CNB (<1%) (Sikdar and Garry, 1998). The latter produces an isomeric mixture containing the meta isomer as the major CNB constituent (James, 1980a). As chemical isomers usually have similar boiling points and other similar physical and chemical properties, separation of the CNB isomers into pure or substantially pure fractions is a challenging task and involves a series of complex process steps (James, 1980a; Roberto, 1974).

There are many commercial processes that have been developed for separation of CNBs, e.g. crystallization, fractionation and adsorption. Crystallization is considered to be commercially attractive compared with distillation. However, the eutectic point is the limit for this process (Mullin, 2001). Adsorptive separation with a suitable adsorbent is another alternative that can separate the isomers by selectively adsorbing desired products and excluding others. The adsorbent plays a key role in the process of separation.

FAU zeolites are used in many industries. These zeolites are useful for adsorption of relatively large aromatic molecules. The key aspect to understand the adsorption mechanisms and study the adsorbate-adsorbent interaction is very important. Apart from the molecular sieving properties of adsorbent, there are many factors that affect the adsorptive properties of different CNB isomers. An expected feature of this particular system is the interaction between the active acidic adsorption sites on the zeolite and the aromatic solutes.

The purpose of this research is to study the effects of various FAU adsorbents (Si/Al = 1.25, 2.5) including various exchanged cations in adsorption for the separation of CNBs at 30°C. Moreover, effect of desorbent on adsorption and competitive adsorption between each isomer will be observed.