CHAPTER I
INTRODUCTION

Chloronitrobenzenes or CNBs, which are isomeric substances, consist of *o*-, *m*- and *p*-CNB. They are used as an important starting material for the manufacture of azo and sulfur dyes. Furthermore, they are applied in the synthesis of pesticides, fungicides, preservatives, photochemicals, rubber chemicals, and pharmaceuticals. CNBs are produced commercially by chlorinating nitrobenzene and nitrating chlorobenzene. To fully utilize each isomer, an efficient separation method is needed. However, the methods such as distillation, adsorption, and crystallization for separating the isomers are complicated and costly (Priegnitz, 1980).

Adsorption is one of suitable techniques that can be used to separate CNBs into a pure form because it reduces energy consumption and provides a high-purity product. An appropriate adsorbent is an important factor in the adsorptive separation. FAU zeolites are widely used in the chemical industry as an adsorbent due to their high adsorption capacity and selectivity.

The other attractive technique for separating CNB isomers is crystallization, which can be carried out either in the presence of solvent (solution crystallization) or the absence of solvent (melt crystallization) (Roberto, 1974). Melt crystallization is attractive because of low-energy required, low costs, and ease in operation. This method can separate each isomer by using differences in the melting points. However, the presence of the eutectic point is the obstacle for complete separation of CNB isomers resulting in the low product purity.

Pattanapaiboonkul (2009) studied the effect of feed compositions on the *m*- and *p*-CNB crystallization in the absence of zeolites. Below the eutectic composition, the precipitate composition was rich in *p*-CNB. At the eutectic composition, amorphous precipitates occurred and their compositions closed to the feed compositions. Above the eutectic composition, the precipitate composition was rich in *m*-CNB. When the effects of adding a zeolite on the *m*- and *p*-CNB crystallization were investigated, the result showed that the presence of the zeolites did not affect the feed composition, but the precipitate composition for the feed composition below, at, and above the eutectic composition were rich in *p*-CNB. The precipitates near the

zeolites had higher purity of *p*-CNB than the precipitates far from zeolites. Temperature variation in the solution during the experiment was minimal. Although different types of adsorbents were used for the investigation, the precipitate composition was still shifted from being rich in *m*-CNB to *p*-CNB.

In this work, the influence of feed composition and the number of FAU zeolites on the crystallization and composition of *m*- and *p*-CNB was studied. The purity of the precipitates and crystallization temperature were also studied. Moreover, the effect of seed crystal on crystallization and the precipitate composition were investigated.