CHAPTER I
INTRODUCTION

2,6-dimethylnaphthalene (DMN) is known as a precursor to polyethylene naphthalate (PEN) (a polyester which has enhanced properties). It is the requirment of high purity 2,6-DMN that limits the utilization of PEN polymer. The complication in 2,6-DMN purification results primarily from the isomerization thermodynamics that controls DMN composition. And, as DMN isomers have very similar properties, the separation cannot be done without the use of high energy (ChemSystems, 2000; Lillwitz, 2001).

Up to now, a lot of research has been done to find the most selective 2,6-DMN synthesis methods, but none of them provides the isomer with acceptable purity. Instead, the isomerization among DMN isomers has become interesting. DMN consists of ten isomers having two methyl groups at different positions in the molecules. These isomers can be divided into three groups, each called a triad, with an additional single isomer. It is well known that isomerization of isomers within the same triad can take place more readily than that of isomers between different groups (ChemSystems, 2000; Lillwitz, 2001). Thus, one way to increase the concentration of 2,6-DMN in the product stream is to focus on the 2,6-triad isomerization route (Figure 1.1).

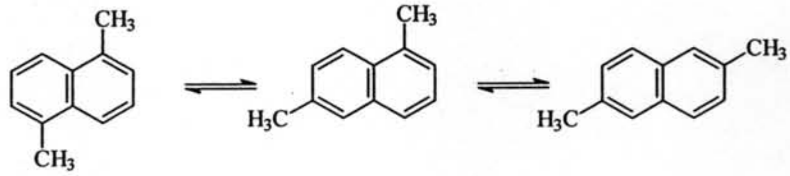

Figure 1.1 2,6-triad isomerization route (Kraikul *et al.*, 2005).

This reaction, however, is thermodynamically controlled; thus, only 48 wt% of 2,6-DMN can be produced at its equilibrium under controlled conditions (Lillwitz, 2001; Kraikul *et al.*, 2005). Moreover, the side reactions, e.g. isomerization across the triad and disproportionation, are usually co-proceeded if the employed catalyst or reaction temperature is not appropriate (Bakas and Barger, 1988; Barger *et al.*, 1991; Ferino *et al.*, 1996; Takagawa *et al.*, 1996b; Motoyuki *et al.*, 2000).

Recently, the use of toluene as a solvent media the isomerization with H-beta catalyst has been reported for its advantages on the facilitation to a continuous operation in liquid phase, improvement of the mass transfer, and modification of the isomerization thermodynamics (Kraikul *et al.*, 2006a). As a result, the maximum yield of 2,6-DMN at equilibrium can be better accomplished at significantly lower temperature without any side reaction (Kraikul *et al.*, 2006a). In addition, they also reported the success of 2,6-DMN purification using the adsorption technique with such a solvent as a desorbent over some selected ion-exchanged faujasite zeolites (Kraikul *et al.*, 2006b). From literature, it seems that the use of a solvent in the high purity 2,6-DMN production process plays a very important role. However, little attention has been paid to this issue; so, a study of the solvent effect was conducted in this research to improve the yield in 2,6-DMN production.

The purpose of this investigation was to study the effects of solvents on the isomerization of 1,5-DMN to 2,6-DMN over H-beta catalyst. The choosen seven solvents were benzene, toluene, ethylbenzene (EB), p-diethylbenzene (pDEB), o-xylene, m-xylene, and p-xylene. In addition, their effects on the adsorption characteristics over selected faujasite adsorbents (NaX and NaY) were investigated and discussed.