CHAPTER I
INTRODUCTION

Environmental regulations set limits in the content of aromatics in motor gasolines and impose a challenge to refiners, who need to maintain high octane numbers while decreasing aromatic content. By 2010, the EU will limit aromatic content to 14% and PAH content to 2%, while the U.S. federal and California Air Resources Board (CARB) specifications will remain at 35% and 10% respectively for aromatics. (Ringelhan *et al.*, 2004). Hydrogenation of aromatics into alkylcyclohexanes (naphthenes) would result in significant losses of octane number (Weitkamp *et al.*, 2000) and hydrocracking would lead to losses in molecular weight with consequent losses in gasoline yield (Raichle *et al.*, 2001). An interesting aspect to investigate is the conversion of naphthenes into non-aromatic compounds with the same number of carbon atoms as the original molecule, but with higher octane number.

The conversion of naphthenic molecules has been extensively investigated on metal, acidic, and bifunctional (metal/acid) catalysts for many years. Several reactions are known to occur, such as isomerization (including ring-contraction), ring-opening, dehydrogenation, and cracking, depending mainly on the reaction conditions, the feed, and the catalysts used (Santikunaporn *et al.*, 2004). Methyl-cyclohexane (MCH) was considered as a suitable representative reactant for this catalytic test since it came from the hydrogenation of toluene and its RC products leads to the informative product mixture (McVicker *et al.*, 2005). In order to obtain high octane number gasoline, only appropriate ring-contraction products which ascribed as intermediate products result in the high branched-alkanes.

Consequently, in this work, the catalytic properties in the hydroisomeri-zation of MCH in the presence of hydrogen over acidic and bifunctional catalysts were studied in order to elucidate the effects of shape selectivity and the acidic strength of catalysts on the selectivity of RC isomers. Additionally, the effect of acid density was studied by comparing the results from the same type of FAU zeolite (CBV series) with various Si/Al ratios.