# Synergy effect of mixed naphtha/methanol feed on catalytic cracking reaction

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The naphtha catalytic cracking using zeolites produces a high propylene/ethylene ratio at lower reaction temperature. Although comparing with thermal cracking, the reaction temperature thereof is relatively reduced, it does not completely overcome the problem of high energy consumption and high methane production [1]. Using the acidic catalyst may achieve the cracking of the raw material hydrocarbons at a relatively low temperature, but there is still the problem of system heat supplying [1]. The disadvantage of this route is its high endothermicity, which makes it a very energy consuming process. Some researchers have studied on catalyst development for high-efficient transformation and less energy cost, while some efforts are also put on alternative way, such as, introducing some exothermic conversion processes for energy supply into the endothermic hydrocarbon cracking[2]. Considering the energy balance and target products, exothermic MTO/MTG process is a good option for this coupling system. A relevant aspect for the feasibility of this new process is that it can be performed under energy-neutral conditions by combining endothermic cracking with the exothermic stage of methanol dehydration.

Nowak et al. add C4 hydrocarbon during methanol conversion process to conduct the heat coupling [3]. At a reaction temperature of 600-700 ℃, when the molecule ratio of methanol to n-butane is 3:1, the reaction process on the HZSM-5 molecular sieve achieves the thermal neutralization. The coupled cracking of methanol and $C_6$ hydrocarbons and naphtha also shows the promotion effect for the low carbon olefins production. Lu¨ cke and co-workers [4] investigated the coupling transformation of some hydrocarbons with methanol participation. Gao and co-workers [5] investigated the coupled conversion of methanol and light hydrocarbons over Ga/HZSM-5 catalyst at moderate temperature (<550 C), and studied the effect of reaction conditions on the yield of aromatics and lower alkenes. In these studies discussed above, besides the consideration of energy supply, most of the study efforts were put on modifying reaction condition and zeolite catalyst for higher light olefins yield. However, for the conversion of methanol and the catalytic cracking of n-hexane, they are such reactions catalyzed by acid zeolite catalyst, although both reactions are quite different.

In this work, the catalytic cracking reaction using mixed naphtha and methanol will be investigated with synthesized ZSM-5. Also, the effect of methanol on naphtha will be studied in more detail. By comparing the yield of light olefins depending on mixed feed ratio (methanol/naphtha ratio), reaction temperature, space velocity and acidity on ZSM-5 will be discussed.

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