Study on the enhancement of zeolite-based solid catalysts by controlling crystal size and metal particle encapsulation structure

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Zeolites are porous materials that have both molecular sieving and acid catalytic properties, and are applied to various solid catalytic reaction processes ranging from the synthesis of chemical raw materials to exhaust gas purification. In this presentation, the synthesis of lighter olefins (e.g. ethylene and propylene) by catalytic cracking of naphtha using zeolite catalysts with different crystal sizes and the production of syngas by methane reforming using zeolite catalysts encapsulating metal nano-particles are introduced.

Based on the Thiele modulus and effectiveness factors of the zeolite catalysts, which were obtained from the kinetic analysis of naphtha catalytic cracking, the effect of the crystal size on the reaction rate-limiting step and the catalyst stability was discussed. Moreover, the metal particles encapsulated zeolite exhibited high sintering resistance due to the encapsulated structure, demonstrating its effectiveness in methanogenic reforming