

Surfactant-Templated Zeolites: The bridge Between Zeolites and MCM-41 that Made it to the Refinery

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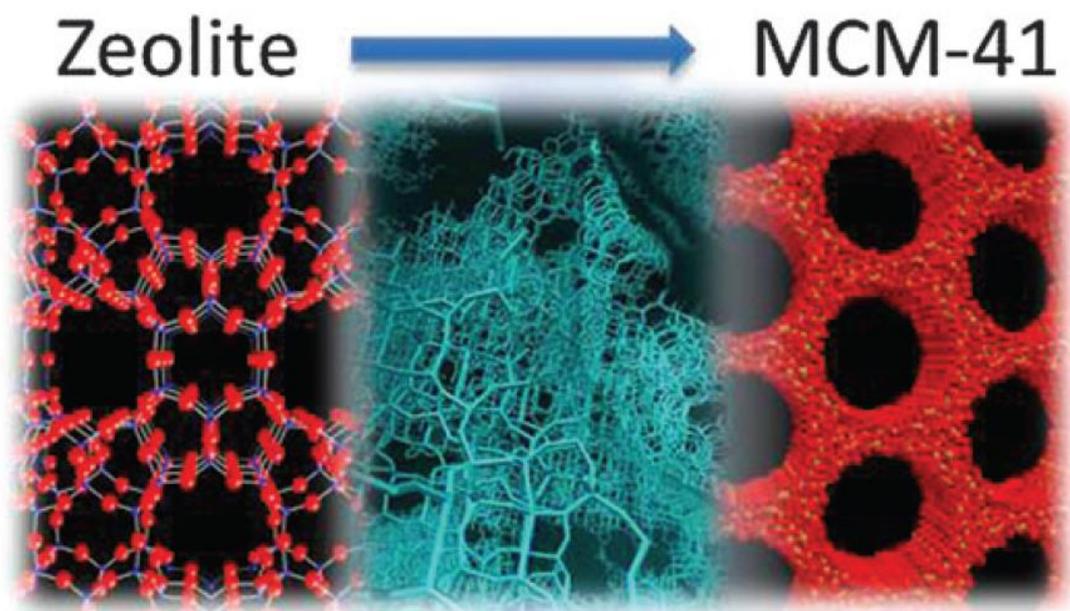
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The small size of the micropores in zeolites causes slow diffusion of reactant and product molecules in and out of the pores, and negatively impacts the product selectivity of zeolite based catalysts, e.g. fluid catalytic cracking (FCC) catalysts. To overcome this limitation, surfactant-templating has been widely used to impart controllable mesoporosity in amorphous materials, such as MCM-41. However, they lack the superior hydrothermal stability and strong acidity and therefore, they really never fulfill their promised as more accessible catalysts for the chemical industry.

Building on this strategy, we have introduced size-tailored mesoporosity into commercial zeolite Y crystals by a simple surfactant-templating post-synthetic modification process that can be tuned by the size of the surfactant micelles. During the presentation, unambiguous evidence of the presence of surfactant-templated intracrystalline mesoporosity in zeolites will be shown. This includes advanced gas adsorption and electron microscopy and rotation diffraction. Zeolite Y is the most widely used zeolite in catalysis and the developments in mesoporous Y reflect the general “landscape” of mesoporous zeolites. The preparation of mesoporous Y, the materials’ properties, detailed characterization, and their catalytic will be presented. The scale-up and use of mesostructured zeolite Y on an industrial scale will be presented, which demonstrate, for the first time, the promising future of hierarchical zeolites in large scale industrial applications.

Surfactant-templated zeolites represent the bridge between zeolites and surfactant-templated materials and the successful commercial realization of the promising mesoporous materials in those processes where zeolites are diffusion limited.



Relevant references:

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