What makes mesoporous zeolites unique in catalysis: Abundant external acid sites and fast molecular transport

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Zeolites are crystalline microporous aluminosilicates. Zeolites have achieved great industrial success as a solid acid catalyst due to their molecular sieving effect (size- and shape-selectivity) as well as strong acidity. In recent years, mesoporous or nanocrystalline zeolites have attracted great scientific attention due to their unique catalytic properties, which cannot be obtained with ordinary zeolites composed of micron-sized crystallites. In the present lecture, significant advantages of using mesoporous zeolite catalysts in various reactions will be demonstrated. In many cases, the advantages originate from enhanced molecular transport, which can suppress undesired overreactions in consecutive reaction networks. The enhanced molecular diffusion can also lead to significantly increased catalyst lifetime due to markedly retarded coke deposition. In addition, these zeolites generally have large amounts of external acid sites, which are useful for the conversion of bulky molecules that cannot be processed in small zeolite micropores