Surfactant-Directed Mesoporous Beta Zeolite as a Catalyst for Friedel-Crafts Alkylation

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Zeolites can be used as catalysts in Friedel-Crafts (FC) alkylation, but in liquid phase reactions, the catalysts have very short lifetimes or very limited turnovers. This seems to be related to diffusion limitations, whereas FC alkylation products are often close to or bigger than zeolite pore apertures. Here, we investigated FC alkylation catalytic performance of beta zeolite having mesoporosity. This zeolite was recently synthesized in our laboratory using a surfactant-type zeolite structure-directing agent. We have investigated the reaction kinetics for benzylation of benzene with benzyl alcohol in the liquid phase, and the effect of the mesopores on the catalytic performance. Further works were performed on the details of the FC alkylation, such as the temperature effects, reactant concentrations, poisoning of the external surfaces of zeolite, in order to improve the catalytic lifetime. This investigation clarified why the zeolites had short catalytic lifetimes in liquid-phase FC alkylation. We provided helpful information to improve the catalytic lifetime.