478f Characterization of Organsulfonic Acid-Functionalized Mesoporous Silica

Isa K. Mbaraka and Brent H. Shanks

Supramolecular-templated mesoporous materials with their combination of extremely high surface area and flexible pore sizes as well as having a well-defined mesostructure are attractive in designing catalysts and catalytic supports with potential for improved product selectivity and yield. Incorporation of organosulfonic acid groups into the mesopores by either grafting on the preformed mesostructure or direct co-condensation during synthesis has led to formation of acidic solid catalysts. Understanding and controlling the acidity of the organic acidic functional groups is of importance to the overall catalytic performance of the final acid-functionalized mesoporous silica catalyst. The catalytic activity of the acid-functionalized mesoporous silica catalyst will be influenced by the location of acidic sites as well as proximity of the tethered organic acidic functional groups.

To understand the acidity of organosulfonic acid-functionalized on mesoporous silica material, propylsulfonic and arenesulfonic acids were incorporated by co-condensation technique into the SBA-15 mesostructure at different concentrations. Characterization of the incorporation of the organosulfonic acid moieties as well as the acid strength of the resulting organic-inorganic hybrid materials will be discussed. Results will also be presented for the tethering of propylsulfonic acid pairs onto the mesoporous silica, which probes the relationship between acid site proximity and acid strength. Finally, esterification of fatty acids as a pretreatment step in the production of alkyl esters from feedstocks with high free fatty acid content was used as an additional probe for catalytic activity of the acid-functionalized mesoporous silica materials.