The Development of Mesoporous Phenolic Resins as New Solid Acid Catalyst

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In recent years, the development of ordered mesoporous polymers – a new class of mesoporous materials – has attracted increasingly attention since these materials combine the large surface areas and porosity of mesoporous materials with the characteristics of organic polymers. In the field of catalysis, these materials are nowadays explored as straightforward heterogeneous support for different types of catalytic reactions. [1,2] An important advantage of phenol/formaldehyde resins is the very high mechanical and hydrothermal stability, especially in comparison with the relative unstable silica based mesoporous materials. [3]

In this study, highly ordered mesoporous phenolic resins are discussed as acid catalyst in the esterification of propanol with acetic acid. The mesoporous resins exhibit large surface areas of more than 500 m²/g, large pore volumes (0.5 cm³/g) and narrow pore size distributions (6 nm).

The polymers are sulfonated using two different sulfonation routes: (a) by direct sulfonation of the aromatic rings or (b) by grafting sulfonic acid precursors on the hydroxy groups. By optimization the reaction conditions (different types of sulfonic acid precursors, reaction temperature and time, etc.), catalysts with acidities ranging from 0.2 to 2 mmol/g are synthesized.

These acid solid catalysts are investigated for their catalytic activity in the esterification of propanol with acetic acid. The differences in catalytic performance is thoroughly discussed. Finally, regeneration properties and stability in successive catalytic runs are evaluated.


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