Application of Mesoporous Silica Foam for Chiral Intermediates Fabrication

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Microporous zeolite materials have attracted significant interest in the field of adsorption and catalysis because of their surface area, unique pore structure and hydrothermal stability. However, their pore sizes are not efficient for processes involving large molecules. As a result, some recent research on the synthesis of mesoporous materials with large pore sizes and uniform pore size distribution has been performed.

In this study, a mesoporous monolithic silica foam was newly synthesized from SBA sols. A large meso/macroporous silica monolith with the form of the mold was fabricated on the centimeter scale. The foam-type silica monolith composites with three-dimensional macropore channels also could be gained from a mixture of polymethylmetacrylate/SBA (PMMA/SBA) silica sol. At high temperatures, PMMA/SBA silica sol was expanded and solidified to a foam structure. After eliminating the PMMA polymer beads, a mesoporous silica foam was left. By expansion into a foam structure, micro/meso/macroporous silica monolith also fabricated from the MFI zeolite/SBA sol mixture. These porous supports were used to anchor the (BF_3) containing chiral Co(III) salens, and they were packed in the tube for use as a catalyst in the continuous flow type packed bed reactor system. The asymmetric catalytic activities of these catalysts were examined in the HKR and PKR of ECH. This hierarchically-ordered macro/mesoporous silica was quite useful for anchoring bulky chiral catalysts, such as salen complexes. Based on the asymmetric HKR and PKR reactions accomplished in this study, the meso/macroporous silica monolithic foams could be applied as effective supports for the enantioselective synthesis of chiral compounds.

In regard to Experimental, Fig. 1 presents the typical procedure to fabricate the mesoporous silica foam. Also solvent plays a important role in this reaction. In the typical example, during the PKR reaction of (±)ECH with phenol or chlorophenol, the effects of polar and nonpolar solvents were investigated, and nonpolar solvents, such as TBME was found to be the most suitable solvent, as illustrated in Fig. 2.

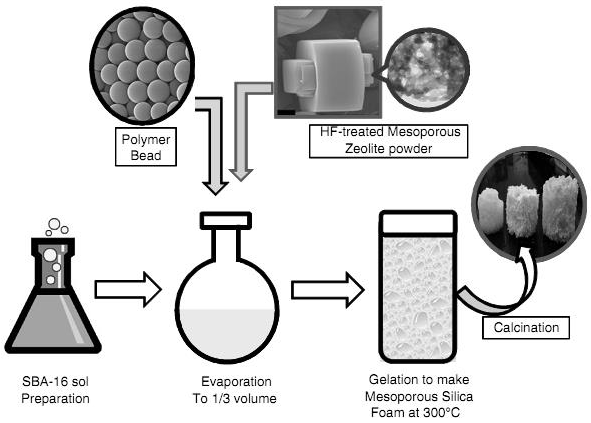

Fig.1 Procedure for the fabrication of monolithic mesoporous silica foams.

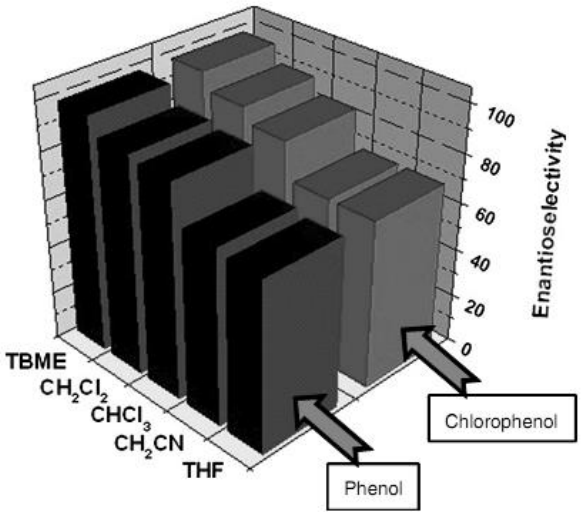

Fig. 2 Effect of various solvents on the enantioselectivity in the PKR reaction of ECH by phenol and chlorophenol (highest ee%in the system, flow rate: 40 mL/min).

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