

#### **467b Mesoporous Materials for Biocatalysis, Biosensors, and Asymmetric Catalysis**

*Taeghwan Hyeon, Jinwoo Lee, Jungbae Kim, Jaeyun Kim, Sunmi Jin, Hongfei Jia, Ping Wang, Ja Hun Kwak, and Jay W. Grate*

Hierarchically ordered mesocellular mesoporous silica materials (HMMS) were synthesized using a single structure-directing agent under a near neutral condition. The walls of cellular pores in HMMS are composed of SBA-15 type mesopores. We employed adsorption of enzymes followed by cross-linking using glutaraldehyde (GA treatment) in HMMS. The resulting enzyme aggregates (CLEA) in HMMS shows high activity and impressive stability with high loading. Mesocellular carbon foam (MSU-F-C) possessing two different sized pores was employed as a host matrix for enzyme immobilization. Due to its unique structure, the MSU-F-C enabled high enzyme loading without serious mass-transfer limitation, resulting in high catalytic efficiency. A highly sensitive and fast glucose biosensor was fabricated by simply immobilizing glucose oxidase in mesocellular carbon foam. The cinchona alkaloid-anchored on the magnetic hierarchically ordered mesocellular mesoporous silica (M-HMMS) system was successfully applied to the repetitive use in catalytic asymmetric dihydroxylation. The immobilized ligand for asymmetric dihydroxylation exhibited almost the same activity and enantioselectivity for the reactions of several olefins as those obtained in the homogeneous reaction. Magnetically recovered ligand could be recycled eight times without any significant loss of yields or enantioselectivities through the use of an external magnet.