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Merging multifunctional catalytic centers within homochiral metal-organic frameworks: New opportunity for heterogeneous asymmetric catalysis

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As the hybrid solids with infinite networks built from organic bridging ligands and inorganic connecting nodes, metal-organic frameworks (MOFs) are ideally suited for catalytic conversions, because they can impose sizeselective restriction through readily fine-tuned channels and pores. Analogues of homogeneous privileged asymmetric metal catalysts or organocatalysts can be synthetically incorporated into MOFs, thus resulting in the incorporation of the selectivity of these single-site catalysts into micropores, and thereby enhancing the shape-, size-, and enantioselectivities of catalytic reactions in comparison to those performed in homogeneous solution. On the other side, the comparable degrees of stereocontrol of delicatedly designed homogeneous asymmetric catalysts could be reached just by incorporation of the much more simplified chiral analogues within MOFs. With the development of synergistic catalysis, combinations of asymmetric catalyst and a second functional auxilliary were employed to realize miscellinous asymmetric transformations, of which the synergy and compatibility of different catalytic cycles still should be carefully tuned to avoid the mutual disturbances among them. Merging asymmetric catalysts and other functional axilliaries within MOFs lead to the spatial discreteness among catalytic centers, avoiding their self-quenchings and mutual disturbances and providing precise knowledge about the pore structure and the nature and distribution of catalytically active sites. Merging polyoxometalates, organic dyes, and noncovalent interaction sites into homochiral MOFs has been realized by us and was proven an powerful tool in construction of MOFs-based heterogeneous synergistic asymmetric catalysts, which provided a new exciting opportunity for the synthesis of enantiopure compounds, including chiral drugs and fine chemicals.

Biography

Chunying Duan has completed his PhD in Inorganic Chemistry, Nanjing University, China and was promoted to a full Professor in 2000. At present he is the Deputy Director of State Key Laboratory of Fine Chemicals, Dalian University of Technology, China. He has dedicated to Chemistry of Werner type architectures, focusing on the biomimetic sensing and molecular imaging, asymmetric catalysis and enzyme-inspired catalysis, and has published more than 200 papers in reputed journals such as *Nat. Commun., J. Am. Chem. Soc., Angew. Chem. Int. Ed.*, and etc.

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