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Editorial (Special Issue on Catalysis in Organic Synthesis)

Preface to Special Issue on Catalysis in Organic Synthesis

Organic synthesis plays a central role in chemistry. The creation of compounds with new properties and functions both distinguishes synthetic chemistry from other sciences and also emphasizes chemistry's central place in science. In principle, the possibilities for atomic and molecular manipulation are unlimited, which provides a firm molecular basis for bioscience, materials science and medical science. Man-made chemicals have entered many research fields where they play important roles. Synthesis is changing all aspects of human society and improving the quality of our life. Catalysts are the workhorse of the manufacture of chemicals since more than 80% of modern chemicals are produced using at least one catalyst. The replacement of stoichiometric synthetic steps by more efficient catalytic processes enables the flexible manufacture of useful compounds using low cost, energy saving and environment friendly routes. For this reason, catalysis is one of the most important research subjects.

Homogeneous catalysis and heterogeneous catalysis form the sub-disciplines of traditional chemical catalysis. Homogeneous catalytic reactions generally use organometallic complexes or organic molecules which are soluble in the reaction solvents as catalyst. These catalysts have well-defined active sites with relatively high activity and selectivity. However, the many difficulties that confront researchers when homogeneous catalysts are applied in large scale industrial processes include the recycling of the catalyst, catalyst stability and handling. Heterogeneous catalytic reactions feature the use of solid catalysts that are insoluble in the reaction medium, which can be a liquid or gas phase, and the catalytic process occurs at the interface of the two phases. Solid catalysts often show better stability than homogeneous catalysts and are easily separated from the products for recycling. However, the nature of their active sites and the reaction mechanism are still ambiguous in most cases due to the lack of effective means to investigate these. For a long time, much effort has been devoted to bringing together the two kinds of catalysts that have been developed independently. In order to use the advantages of both homogeneous catalysis and heterogeneous catalysis, a major strategy is to immobilize a molecular catalyst on a solid support. Unfortunately, this strategy is still hampered by issues such as a lower performance than the homogeneous counterparts, leaching of the catalyst, etc. Although catalysis has now reached an extraordinary level of development, there is still vast room for

further development. We believe that catalysis has a brilliant future as an irreplaceable technology in the global chemical industry.

This special issue of *Chinese Journal of Catalysis* contains 15 research articles that focus on catalytic applications in organic synthesis, such as organic transformations catalyzed by homogeneous metal complexes, organocatalytic reactions, and heterogeneous and immobilized catalyst systems. It is our hope that this issue will provide a valuable reference and perspective of the use of homogeneous and heterogeneous catalysis in modern organic synthesis, and would also stimulate more efforts to bridge the gap between homogeneous and heterogeneous catalysis.

Finally, we would like to thank all the authors and reviewers who contributed to this special issue. It is their expertise, enthusiasm, and hard work that resulted in this high quality issue. We also want to thank the editorial and production staff for the time and effort they have devoted.

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