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Editorial (Special Issue on Celebrating the 40th Anniversary of Institute of Catalysis, Zhejiang University)

Preface to special issue on celebrating the 40th anniversary of Institute of Catalysis, Zhejiang University

In 1978, Professor Songshou Jin, a Chinese prestigious physical chemist, established Institute of Catalysis, Hangzhou University, the forerunner of Institute of Catalysis, Zhejiang University. In 1998, the current Institute of Catalysis was re-established through the merger of Zhejiang University and Hangzhou University et al. During the past forty years, researchers in Institute of Catalysis had always paid much attention to the combination of fundamental researches and industrial applications under the lead of Songshou Jin, Xiaoming Zheng, Weimin Lu, Hui Lou, and Yong Wang. The major research interest includes: (1) basic application research and exploitation of catalysts and catalytic process regarding conversion of biomass, methane, syngas and carbon dioxide; (2) development of catalysts and reaction apparatus for industrial hazardous gas, indoor gas, vehicle emissions and oil smoke from hotels and restaurants; (3) synthesis, characterization of functional materials and their applications in the green synthesis in fields of medicine, pesticide and fine chemical; (4) heterogeneous and homogeneous catalytic reaction kinetics and surface chemistry; (5) catalytic researches regarding military project.

This special issue, guest-edited by Yong Wang, celebrates the 40th Anniversary of Institute of Catalysis, Zhejiang University. The issue was conceived as a collection of selected contributions by several experts in Zhejiang University and some who had ever done researches here. Although the final collection of papers represents only a short list, it is no doubt that these papers can give a comprehensive overview of research fields, which fellows in Zhejiang University had devoted themselves to all the time. In the following, a brief description of papers included in this issue is provided to serve as an outline to encourage further reading.

Developing novel and efficient catalysts is always an important theme for heterogeneous catalysis from fundamental and applied research points of view. Wang et al. gave a perspective and focused on the recent developments of N-doped carbon-supported metal and/or metal oxide catalysts for heterogeneous hydrogenation applications, during which,

various N doped carbon materials and the possible effect of heteroatom N are highlighted, thereby providing guidance for the rational design of advanced catalysts for hydrogenation reactions. Hou et al. reviewed the recent progresses in selective oxidation of glycerol under base-free conditions. Continuous oxidation of glycerol in fixed bed reactor and its superiority in the selective formation of dihydroxyacetone were emphasized. Wang et al. discussed the recent advances on the heterogeneous catalytic hydrogenation and the reverse dehydrogenation of *N*-heterocycles. Significant progresses in this field covering synthetic strategies, microstructural and chemical features, catalytic performances evaluation and the internal relations were summarized. Besides, the dehydrogenation of *N*-heterocycles, an important component of liquid organic hydrogen system was also emphasized. Lu et al. provided a review about visible light promoted difunctionalization of alkynes. Several valuable chemical skeletons have been constructed under mild conditions.

It is essential to reveal the structure-performance relationship and further design more efficient catalysts for various applications. Zhu et al. gave a comprehensive review of the crystal phase regulation that endows both noble metal and noble metal based alloy nanoparticles with unique electronic structures and enhanced performances. The crystal phase regulation is a novel strategy to design highly efficient catalysts and determine the structure-performance relationship of metal catalysts. Fan et al. revealed the specific role of polymeric phosphate, which was decorated on the surface of NiO, on propylene selectivity in oxidative dehydrogenation of propane. It not only extends the application scope of ligand modification strategy to high-temperature gas-phase reactions, but also provides a useful approach to engineering the surface structure of metal oxide nanoparticles. Xiao et al. designed a strategy of fast crystallization to prepare nanosized zeolite omega crystals based on the relationship between crystallization time and temperature in the Arrhenius equation. After loading Pt nanoparticles, this catalyst exhibits higher isomerization selectivity and lower cracking selectivity than the conventional

Pt/zeolite omega in the hydroisomerization of n-dodecane. Zhang et al. reported a solvent-free approach for the rapid synthesis of mesoporous Fe_3O_4 (specific surface area up to $170 \text{ m}^2/\text{g}$) and the pore structure can be adjusted by using different templates. This mesoporous Fe_3O_4 exhibited excellent catalytic activity in CO oxidation and could disperse Au nanoparticles (average particle size: $\sim 4 \text{ nm}$) well. Cheng et al. found that Fe-ZSM-5 prepared by freeze drying exhibited superior performance in N_2O decomposition. It indicated that freeze drying could be a versatile strategy to enhance the metal-support interactions, compared with common evaporate drying.

Several contributions are related to environmental protection. Zhou et al. demonstrated the synergistic effect between Nb_2O_5 with abundant strong acid sites and $(\text{Ce,Cr})_x\text{O}_2$ with strong oxidation sites in the deep catalytic oxidation of 1,2-dichloroethane (DCE), one of the typical chlorinated VOCs pollutants. It showed that the strong acid sites of the Nb_2O_5 promoted the adsorption and dehydrochlorination of DCE, while the strong oxidation sites $(\text{Ce,Cr})_x\text{O}_2$ contributed to the deep oxidation of the reactant, the intermediates and byproducts. Wang et al. investigated the mechanism of N_2O formation over Pd/ CeO_2 catalyst during the catalytic reduction of NO using NH_3 as the reductant in the absence of O_2 . The formation of N_2O was confirmed to be temperature-dependent. This study can provide guidance for the suppression of N_2O emission in the low-temperature SCR of NO with NH_3 .

Various new catalytic processes, such as electrocatalytic water splitting, are also involved. Xia et al. reported free-standing 3D nickel arrays with cross-linked porous structure prepared by a facile one-step electrodeposition

method. The designed 3D Ni arrays exhibit superior electrocatalytic OER performance due to the huge surface area and abundant channels for electron/ion transportation and enhanced electronic conductivity. Zhang et al. fabricated a novel hierarchical porous nanocomposite of cobalt phosphide nanocages@ferric-zinc mixed metal phosphide nanotubes (denoted as CoP@ZnFeP) via a self-assembly approach. This nanocomposite showed excellent activity toward overall water splitting due to its structure and compositional merits.

At last, we would like to thank all the authors who contributed to this thematic issue. Their contributions represent excellent examples of the current research trends in the field of catalysis. We also wish to thank the editorial staff of Chinese Journal of Catalysis for their help to organize this issue. We hope that the topics presented in this issue would inspire the readers to further explore the interesting science of catalysis.

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