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Preface

This is a special Peking University (PKU) issue of *Coord. Chem. Rev.* in celebration of the centennial anniversary of the chemistry department at Peking University. The title of this commemorative issue is "Novel and Smart Materials: Design, Synthesis, Structure, Properties, and Applications."

The chemistry department at Peking University was originally established in 1910 as the Chemistry Division of the Metropolitan University in Qing Dynasty. It is the oldest chemical institution of national universities in China. In 1919, the Division was formally given the name of Chemistry Department. During the nationwide reorganization of universities in 1952, the chemistry departments from Tsinghua and Yanjing Universities were merged into the Chemistry Department of Peking University. Finally, to reflect the molecular nature of chemistry, the Chemistry Department was renamed College of Chemistry and Molecular Engineering (CCME) in 1994.

At present, CCME embraces five academic departments, five research institutes, two state key laboratories and three key laboratories at the ministry level. Academically, it covers all sub-disciplines of chemistry, including physical, organic, inorganic, polymer, analytical and theoretical, and chemical biology. In 2003, CCME set up "Beijing National Laboratory for Molecular Sciences", one of the first six national laboratories in China, in collaboration with the Institute of Chemistry, Chinese Academy of Sciences, under the auspices of the Ministry of Science and Technology.

Currently, CCME has about 200 faculty and staff members, including fifty-three full professors. Among the faculty members, there are eight members of the Chinese Academy of Sciences, fifteen Cheung Kong Professors, and twenty-nine Distinguished Young Scholars of the National Natural Science Foundation of China (NSFC). There are also three Innovative Research Teams (inorganic, physical, and organic chemistry) currently supported by NSFC.

CCME was recognized by the Ministry of Education in 1993 as one of the prestigious "National Pools for Talents in Basic Scientific Research and Education" in China. In the past century, it has educated and trained over 10,000 chemists. It publishes two academic journals, "Acta Physico-Chimica Sinica" and "University Chemistry." It has wide connections and extensive exchange programs with international academic and educational organizations.

Since its inception, CCME, together with its predecessors, has made significant contributions to the modern chemical research and higher education in China, constantly exploring new frontiers in chemical research and implementing many modern concepts in chemical education. The year 2010 marks the centennial anniversary of chemical education and research at Peking University. To help celebrate this occasion, we organize this special PKU issue to showcase the research programs at CCME. Of course, one issue cannot possibly cover all the research projects at CCME. The theme of this special issue is "design, synthesis, and structure of nanomaterials with interesting properties and of technological significance." Even such a description of the scope of this issue is inadequate, since many excellent studies currently being conducted by our colleagues at CCME are not represented here. Nevertheless, we hope that this thematic issue will give the readership of *Coord. Chem. Rev.* a glimpse of the research programs at Peking University.

This thematic issue contains 15 invited reviews, all written by the faculty members at CCME, focusing on the research areas they are involved in. Since chemical synthesis is at the core of chemistry, many of these reviews focus on the syntheses of inorganic, organic, polymeric, and functional molecules or hybrid materials. These latter hybrid molecules or nanomaterials, in particular, take advantage of the superior, often complementary and synergistic, qualities of different types of molecules or materials (organic, inorganic, organometallic, polymeric, etc.) and are important in technological applications. Moreover, most of the reviews fall into the category of either nano or life science. In fact, these two disciplines represent new frontiers in the current evolution of science and technology. It is therefore not surprising to see that most of the reviews deal with the design and synthesis of functional molecules and/or nanomaterials, systematic studies of their structures and properties, as well as applications of these new compositions of matter in technology.

Specifically, the reviews can be grouped into three categories: (a) synthesis: organic, organometallic, inorganic, and polymeric materials (reviews 1–5); (b) functional materials: inorganic functional nanomaterials, biomimic materials, assemblies of coordination supramolecules, single-chain magnets, organic/inorganic hybrid materials, single-walled carbon nanotube field-effect transistors, switches and sensors (reviews 6–10); and (c) applications: nanotube devices, hierarchical quasi-1D semiconductors, information storage, fiber-shaped flexible solar cells, and catalysis (reviews 11–15).

The articles are highlighted below:

In "Catalytic [2,3]-Sigmatropic Rearrangement of Sulfur Ylide Derived from Metal Carbene," Zhang and Wang describe recent developments of [2,3]-sigmatropic rearrangement of sulfur ylide generated from the reaction of sulfide with metal carbene formed by decomposition of diazo compounds catalyzed by transition metal complexes such as Cu(I) and Rh(II).

In "Recent Advances in Arylene Ethynylene Folding Systems: Toward Functioning," Ni, Yan, Ma, and Zhao provide an overview of recent progress on novel properties and functions of arylene ethynylene folding systems.

In "Recent Advances in the Sensitized Luminescence of Organic Europium Complexes," Ma and Wang review recent advances in

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the synthesis, sensitization mechanism, and luminescent properties of organic europium(III) complexes. Emphasis is placed upon developing luminescent europium(III) complexes capable of being efficiently sensitized by visible light or multi-photon absorption of near-infrared light, serving as potential nanoprobes in bioanalysis and bioimaging.

In "Sensitized Luminescence from Lanthanides in d–f Bimetallic Complexes," Chen, Chen, Bian, and Huang summarize recent advances in the research of luminescence of lanthanide ions sensitized by transition metals in d–f bimetallic complexes. Through efficient energy transfer, sensitized luminescence of lanthanide ions from the visible range to the near-infrared region can be obtained. Synthetic strategies, crystal and electronic structures, and photophysical properties of these d–f bimetallic complexes are discussed.

In "Polymer Crystallization of Ultrathin Films on Solid Substrates," Liu and Chen summarize recent progress on ultrathin film crystallization of polymers. The morphologies, crystallization kinetics, and transformation between monolayer crystals are discussed in the framework of the thermodynamics and kinetics of crystallization of ultrathin polymer film. These studies offer unique possibilities for studying the effects of confinement and interface on crystallization.

In "Synthesis and Assembly of Rare Earth Nanostructures Directed by the Principle of Coordination Chemistry in Solution-based Process," Feng, Sun, Zhang, and Yan describe the preparation of novel rare-earth compounds and nanocrystals via the control of synthetic parameters and reaction kinetics based on the principles of coordination chemistry. Systematic characterization of the phases, microstructures, textures, and surface states of these nanomaterials reveal the mechanisms of formation and assemblage, as well as their unusual properties.

In "Colloidal Chemical Approaches to Inorganic Micro- and Nanostructures with Controlled Morphologies and Patterns," Qi reviews recent advances on solution-phase synthesis of inorganic micro- and nanostructures with controlled morphologies and patterns via three typical colloidal chemical routes, namely, synthesis based on catanionic micelles, reactive templates, and colloidal crystal templates.

In "Hierarchical Assemblies of Coordination Supramolecules," Yan and Huang review recent developments in the research of hierarchical assemblies of coordination supramolecules to form a variety of architectures. Through electrostatic interaction, these coordination supramolecules can be incorporated into films, liquid crystals, micelles, hydrogels, etc. Hierarchical molecular devices can be constructed with these coordination supramolecules.

In "Strategies towards Single-Chain Magnets," Sun, Wang, and Gao review synthetic strategies for the construction of single-chain magnets (SCM), a novel class of molecular magnetic materials exhibiting slow magnetic relaxation. Controlled synthesis of SCM and ways to fine tune their magnetic behavior (such as magnetic anisotropy, strong intrachain and weak interchain interactions) are discussed.

In "Chemical Functionalization of Single-walled Carbon Nanotube Field-effect Transistors as Switches and Sensors," Guo and coworkers review recent advances on rational design and chemical functionalization of carbon nanotube field-effect transistors for the purpose of integrating them into functional optoelectronic devices capable of converting external stimuli to easily detectable electrical signals for switching or biosensing applications.

In "Carbon Nanotubes Combined with Inorganic Nanomaterials: Preparations and Applications," Li and coworkers review the superior electronic, optoelectronic, mechanical, and chemical performances of carbon nanotubes when combined with inorganic nanomaterials. This review also summarizes the preparation of such inorganic nanomaterial/carbon nanotube composites and their wide range of applications.

In "Electrochemical Synthesis and Applications of Oriented and Hierarchically Quasi-1D Semiconducting Nanostructures," Wu, Zhu, and Xu review electrochemical syntheses of oriented and hierarchical quasi-1D semiconducting nanostructures and their applications. Specifically, methods such as electrodeposition in porous membranes with 1D pore geometry, nanotube arrays by multi-step template replication and electrodeposition, and template-free methods that make use of capping reagents are described.

In "Organic Charge-Transfer Complexes for STM-Based Thermochemical Hole Burning Memory," Peng and Liu review the state-of-the-art data storage using scanning probe microscopy (SPM). The review first gives an overview of the recent advances of SPM-based data storage from the viewpoints of recording principles including electrical bistability, photoelectrochemical conversion, field-induced charge storage, magneto-optical recording, phase change, etc. It then describes a new thermochemical hole burning data storage technique, recently developed by the group, based on organic charge-transfer complexes for the use in computer memory.

In "Fiber-Shaped Flexible Solar Cells," Zou and coworkers review the various types of fiber-shaped flexible solar cells and their characteristics. Flexible solar cells based on flexible photoelectrodes derived from metal wires, optical fibers, carbon and other materials have the advantages of lightweight, foldability and low cost. In particular, the principles and characteristics of various silicon-based, CuInGaSe, dye-sensitized, and organic photovoltaic flexible solar cells are discussed.

In "Transition Metal Nanoparticles Catalysis in Green Solvents," Yan, Xiao, and Kou provide a review on recent developments of nanoparticles (NPs) catalysis in liquid phase. The roles that the metal core, the stabilizer and the solvent play in NPs catalysis are discussed in detail.

Finally, it is hoped that, through this special issue, we will attract more scientific and educational exchanges and collaborations with our domestic as well as foreign colleagues.

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