Editorial

Jianguo Hou

Structure Research Laboratory,
University of Science and Technology,
Hefei, Anhui 230026, China
E-mail: jghou@ustc.edu.cn

Enge Wang

Beijing National Laboratory for Condensed Matter Physics,
Institute of Physics, Chinese Academy of Sciences,
Beijing 100080, China
E-mail: egwang@aphy.iphy.ac.cn

Shihe Yang

Department of Chemistry,
Hong Kong University of Science and Technology,
Clear Water Bay, Kowloon, Hong Kong
E-mail: chsyang@ust.hk

It has been our greatest pleasure to edit this special issue that is devoted to nanotechnology research in China. It should be noted that no single issue of a journal can completely cover all aspects of nanotechnology research in China. The articles collected here just represent some snapshots of aspects of the large and increasingly successful efforts that the scientists and funding agencies have recently put into nanotechnology research.

Nanotechnology is a new emerging field to understand and control matter at dimensions of roughly 1 to 100 nanometres, where unique phenomena enable novel applications. From the end of 1990s, the major funding agencies in China, like Ministry of Science and Technology of China (MOST), National Science Foundation of China (NSFC) started to enhance the support for the research of nanoscience and nanotechnology. Since then, both basic and applied researches in nanoscience and nanotechnology became the priority programs in the institutes of Chinese Academic Science (CAS) and most of research oriented universities. The number of publications and patents contributed by the scientists from China in this field has grown very fast in the last ten years. Since the progress of nanotechnology is expected to provide the solutions for the problems in energy and environment which are the great challenges for China, the most populated country in the world, in the next decades. Very recently, the Chinese government released its National Long Term Development Layout 2006–2020,

Nanoscience and nanotechnology is one of the four national initiative basic research programs. Looking forward, the R&D of nanotechnology will be still one of the most active fields in China.

The nanotechnology research in China covers most aspects of nanoscience and nanotechnology. Four areas have generally been addressed. First, synthesis and growth of nanoscale structures composed of semiconductors, metals and polymers, and to make electronic devices and sensors from molecules and nanoparticles. Second, characterisation of nanostructures and imaging electrons inside nanostructures by various analysis methods, especially scanning probe microscopes (SPMs). Third, manipulation and control of the quantum state such as spins, charges and orbit of the molecule and nanostructures. Last, the application of nanomaterials and nanotechnology in biology and life science, such as drug carriers and therapy. The researchers have so far gained many attracting accomplishments mainly on the assembly, characterisation and manipulation of nanostructure *via* 'bottom up' stratagem, while the design and the fabrication of nanodevices is not adequate due to the incomplete 'top down' techniques based on the weak micro-fabrication process. In 2002, China established the National centre for nanoscience and nanotechnology in Beijing to encourage collaboration and sharing facilities. We believe that a lot of improvements will be made in the near future.

The subjects in this special issue only cover some aspects of nanotechnology researches in China. The review by W.T. Yao et al. gives an overview of recent advances on hydrothermal syntheses of low dimensional nanoarchitectures, and emphasises that a rich family of inorganic nanostructures and their properties can be accessible and controlled by this facile approach. Y.L. Yang et al. review the recent progress on the multi-component self-assembled structure and assembling mechanism. They are focused on the hydrogen bonded supramolecular structures, template effects of assemblies and the host-guest architectures in multi-component molecular systems. The review by Y. Wan et al. illustrates the synthesis of hybrid mesoporous silicates and accessibility to the active sites by focusing on the interactions between inorganic and organic components, which impact on organic-group loading, mesostructure and particle morphology, condensation, as well as organic-group distribution. A concept of 'combinatorial synthesis' is introduced here for the cases of combining two or more functional units in a typical synthesis into a single one. H.B. Liu et al. report on general approaches to the synthesis of π conjugated organic molecular one-dimensional nanomaterials. Also observed are dimension-dependent emission properties for the nanowires and nanorods. Q.T. Wang et al. describe a one-step low-temperature electrodeposition method to synthesise the ordered semiconductor CdO nanowire arrays and explore their optical properties. H.X. Wei et al. propose an approach to fabricate pure metallic Ni-Ni and metallic oxide Ni-NiO-Ni nanocontacts by repeatable micro-fabrication method and investigate the mechanism of magnetoresistance. J. Yu et al. present the synthesis techniques mainly on B-C-N nanotubes and carbon nanoparticles. They show that the electronic property of the ternary B-C-N nanotubes is experimentally controlled by the structure and composition. Q. Chen et al. report the synthesis and application of titanate and related nanostructures. The formation mechanism has been studied both experimentally and through ab initio calculations. P.M. He discusses the growth mechanism of organic semiconductors on metal surfaces. Furthermore, he presents the electronic structures at the organic semiconductor/metal interface with scanning tunneling microscopy (STM) and photoemission spectroscopy (PES) measurements. X.D. Bai et al. present a systematic study of in situ transmission

electron microscopy (TEM) probing properties of individual one-dimensional nanostructures. A new home-made TEM-STM system is described in detail. The mechanical and electronic properties of a single nano-object, such as nanotube and nanobelt, are discussed. Some results in the interdisciplinary of nanotechnology and biology are also presented in this issue. Y. Zhang et al. present a mini-review about the concept and the advancement of a novel strategy of ordered single molecule sequencing based on nanomanipulation for whole-genome sequencing. Z. Chen et al. summarise the most recent findings on the toxicological and biological effects of some nanomaterials (nanotubes, fullerene, metallofullerenes, their derivatives, and metallic nanoparticles). They also discuss the effects of dose, size and nanostructure of particular nanotoxicity on the biological activity. Y.Y. Chen et al. demonstrate the principle and methodology of a biosensor based on imaging ellipsometry operated in the total internal reflection mode, which can monitor real-time multiple protein reaction processes simultaneously with a label-free method.

We hope that this special issue will encourage more nanotechnology scientists and researchers around the world to interact and collaborate with their colleagues in China.