

## Preface

The past decade has witnessed the significantly increasing impact of the Chinese chemical community worldwide and the Chinese chemists are playing an irreplaceable important role. This is reflected by not only the increased number but also the improved quality of scientific publications. Some top level original works have opened new fields or led the frontier of field. These creative works were benefited from the innovative research methods. Therefore, we planned to organize this special topic on Chemical Methodology at the very beginning of this year and received positive support from leading Chinese chemists. Forty chemists contributed to this special issue, including 15 papers about synthetic or fabrication methods, 12 papers on theoretical methods, and 13 papers on instrumentation or research methodologies. According to the language of the original submission, 21 papers in English of this special topic are published on this issue, and the rest 19 papers in Chinese were published on Volume 43, Issue 12 of *SCIENTIA SINICA Chimica*.

The Chinese scholars made significant contribution to the global development of nanoscience and nanotechnology, which roots very much from their unique synthetic methods. Yong Cui *et al.* [1] synthesized chiral Schiff-base ligand through six steps in good overall yield from readily available 2-tert-butylphenol. Qingyi Lu *et al.* [2] controllably synthesized  $\alpha$ -Fe<sub>2</sub>O<sub>3</sub> polyhedrons with different sets of high-index facets using metal ions as structure-directing agents or surfactant as additive. Renchao Che *et al.* [3] reviewed their progress in synthesis and characterization of hierarchical magnetic core-shell nanostructures for microwave absorption. Huanming Xiong *et al.* [4] synthesized ZnWO<sub>4</sub> nanocrystals over reduced graphene oxide hybrids. Wenfu Yan *et al.* [5] investigated the structure-directing effect of *n*-propylamine in the crystallization of open framework. Qiaowei Li *et al.* [6] used an organic ligand with azolate moiety to synthesize layer and zigzag structured MOF. Nanfeng Zheng *et al.* [7] described a robust method for the synthesis of high-quality ZIF-8 nanocrystals. Chen Wang *et al.* [8] introduced the recent progress on construction of two-dimensional nanostructures by host-guest supramolecular chemistry at solid-liquid interfaces. Limin Qi *et al.* [9] overviewed the recent progress in the controllable fabrication of monolayer colloidal crystals.

ChiYung Yam *et al.* [10] overviewed the linear-scaling approaches for excited states solved in real time-domains. Xiao Zheng *et al.* [11] provided a comprehensive account of the recent developments of TDDFT for open systems (TDDFT-OS). Shuhua Li *et al.* [12] reviewed the main idea and the application of the cluster-in-molecule (CIM) local correlation method. Yiqin Gao *et al.* [13] reexamined how the salt ions and some other small molecules could affect water structure and thermodynamic properties. Donghui Zhang *et al.* [14] used neural networks to construct a six-dimensional potential energy surface for the dissociative chemisorption of HCl on Au(111). Daiqian Xie *et al.* [15] summarized the current methodologies on the construction of potential energy surfaces and the quantum mechanical treatments of the dissociative chemisorption dynamics of small molecules on metal surfaces. Wanzhen Liang *et al.* [16] reviewed the analytical derivative techniques for molecular excited-state properties within the framework of TDDFT to do the large-scale numerical calculations. Hao Hu [17] used *ab initio* quantum mechanical/molecular mechanical minimum free-energy path method to determine the height of reaction barriers. Zhonghuai Hou *et al.* [18] proposed an approach to overcome the low efficiency and the trapping into unknown intermediate states of the popular forward flux sampling for nonequilibrium systems.

The development of new methodologies for scientific research is key to innovative work. In this special topic, Mingfei Zhou *et al.* [19] develop a collinear tandem time-of-flight mass spectrometer for infrared photodissociation spectroscopy of mass-selected ions from a pulsed laser vaporization supersonic ion source. Lijun Wan *et al.* [20] developed *in situ* electrochemical atomic force microscopy for studying the morphology and Young's modulus evolution of a graphite anode in lithium ion battery during the cycling process. Chunhai Fan *et al.* [21] described how a clever design and synthesis can make significant contribution to the design and implementation of super-resolution imaging methods.

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