

Preface

The chemical industry is essential to the world economy and to sustaining the high quality of living. However, most current chemical processes are not sustainable in terms of environmental impact and resources because modern life relies mainly on the petrochemical industry. It is a common opinion that sustainable development is a key issue to humanity, which depends on whether we can supply the population with clean water, enough food, materials and energy for the long term without damaging our planet. Green chemistry is an effective way to achieve the goal of sustainability. The well-known Twelve Principles of Green Chemistry provide a framework for scientists and engineers when designing new materials, products, processes, and systems. Briefly, green chemistry is the utilization of a set of principles to reduce or eliminate the use or generation of hazardous substances in the design, manufacture, and applications of chemical products.

Green chemistry deals with a series of interesting topics of great importance. Many current chemical processes lack efficiency of using materials and energy, whereas a focus of green chemistry is to explore synthetic methods that can transform starting materials effectively to reduce waste and to save energy. Because many traditional catalysts are based on metals, which are toxic or harmful, a task of green chemistry is to design and prepare greener catalysts with high activity, selectivity, and stability. This can provide atom-economic, selective, and energetically efficient solutions to many crucial problems in industry. Another promising area is to replace hazardous solvents with environmentally benign media that have no or limited impact on human health and the environment. These media include supercritical fluids, water, ionic liquids, liquid polymers, and their various combinations. Because most chemical products such as bulk and intermediate chemicals, plastics, and pharmaceuticals are produced using finite fossil resources, and many feedstocks used in chemical industry are hazardous, development of efficient and economic methods to convert renewable materials like biomass into valuable chemicals is an important and challenging topic in the field.

Meanwhile, we should develop new routes to use greener, cheaper, and safer reagents in chemical synthesis, such as using molecular oxygen as an oxidation reagent. A huge amount of carbon dioxide is produced as a waste product and converting it into useful chemicals or materials is a key research area in the future. Because many products we are producing now are toxic and environmentally harmful, design and production of greener products is also a very important aspect for green chemistry. It should be emphasized that developing clean and effective processes and technologies for chemical industry is an important topic in the field.

Green chemistry is a rapidly growing field in recent years because of its great contribution to sustainable development and economical benefit to our society. China is the largest developing country possessing more than 20% population of the world. It is no doubt that development and implementation of green chemistry is of special significance to China since the chemical industry contributes significantly to the economic development of the country and will continue to be very important in the future. Meanwhile, the energy and material consumption of many processes for manufacturing chemicals and pharmaceuticals in China is relatively high and the efficiency is insufficient to satisfy the principle of sustainability.

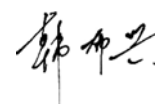
Sustainable development is extremely important for China and green chemistry has attracted much attention from academic institutes, universities, industries, funding agencies, and the government for more than a decade in China. Many leading chemists, young researchers, and chemical engineers are working in this field. This special issue of *Science China Chemistry* on green chemistry includes some of the recent achievements of fundamental studies by Chinese researchers, which consists of 23 articles and covers most aspects of green chemistry. The application of green technologies is not included in this thematic issue although this is a very important branch of the field, and some advanced green technologies are being applied satisfactorily in this territory and more will be utilized in the near future.

It should be emphasized that while it has been developed rapidly for nearly two decades, green chemistry is still in the early stage, and it is a long-term field of great importance to mankind. Many challenging scientific and technological issues within this field are to be solved. We believe that green chemistry has a very bright future, which will make our planet greener and the sky bluer. We hope that this special issue will inspire more studies on green chemistry.

Finally, we would like to thank the authors and referees for their great contributions to this special issue.



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Professor HAN BuXing graduated from Hebei University of Science and Technology in 1982, and received M.S. degree at Changchun Institute of Applied Chemistry, Chinese Academy of Sciences in 1985, Ph.D. degree at Institute of Chemistry, Chinese Academy of Sciences in 1988, and did postdoctoral research from 1989 to 1991 at the University of Saskatchewan, Canada. He has been a professor at Institute of Chemistry, Chinese Academy of Sciences since 1993. His research interests include thermodynamics of green solvents (e.g. supercritical fluids, ionic liquids, water) systems and applications of green solvents in green chemistry. Currently, he is the Chairman of IUPAC Subcommittee on Green Chemistry, Chairman of Thermodynamics and Thermal Analysis Committee, Chinese Chemical Society, Fellow of Royal Society of Chemistry, and is serving some respected journals as Editorial Board Member or Advisory Board Member, such as *Chemical Science*, *Green Chemistry*, *ChemSusChem*, *J. Supercritical Fluids*, *J. Colloid and Interface Sciences*, *Science China Chemistry*.