Development of clean energy and environmental technologies to address humanity's top problems

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This special issue on clean energy and environmental technologies aims at providing a forum for researchers who are working on relevant areas to exchange ideas driving innovation and report their latest research outcomes in developing clean energy and environmental technologies.

A few years ago, Nobel Laureate Richard E. Smalley outlined Humanity's Top Ten Problems for the next fifty years, in a talk given for the Enterprise Forum at Massachusetts Institute of Technology (MIT). Energy was listed as the first of the top ten problems and the environment as the fourth. Actually energy is the most basic requirement for economic development and people's livelihoods while this requirement is constantly increasing, particularly in economically rapidly developing countries like China. Supply of energy still mainly relies on fossil fuels such as coal, petroleum, and natural gas around the world. However reserves for fossil fuels are limited and producing energy from these fossil fuels with existing technologies has caused serious environmental problems, e.g., increasing greenhouse gases emission which exacerbates global warming. Resolutions to these global problems lie in the innovative technologies to produce energy in a clean and environmentally friendly manner. Both developing renewable energy and using energy more efficiently are major components of clean energy and environmental technologies. Development of clean energy and environmental technologies has been thought of as two of the most active research fields today.

This special issue includes 12 papers consisting of research and review articles selected from different research institutions in Australia, China and Indonesia. They contain a wide range of the hottest research topics in clean energy and environmental technologies, including development of the innovative catalysts used for clean energy and environmental processes, studies on hydrogen production and storage, CO₂ capture and syngas clean technology as well as other research in energy efficiency, coal seam gas recovery and environmental economics. These research and/or review articles, which although do not cover the full scope of studies in energy and environment due to page limitations, can still provide readers with brief track references to facilitate the development of new clean energy and environmental technologies.

This special issue was organized as per instructions of the Editors Dr. Fei Yuan, Prof. Yaodong Huang, and Prof. Yanni Li. We have received invaluable help from colleagues working with or having worked with clean energy and environmental research, especially Prof. Edward White, Prof. Duong Do, Dr. Greg Birkett and Dr. Fu-Yang Wang in School of Chemical Engineering, the University of Queensland. They provided careful peer-reviews on the selected papers with many useful comments and suggestions for authors to enhance the quality of the papers. It would be impossible to publish this special issue without the help of these peer-reviewers.

Finally, as the Guest Editor, I would like to thank all the people—all the authors and co-authors and reviewers for their contributions to this special issue, and editors of the *Frontiers of Chemical Science and Engineering* for their scientific input and consistent support.

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*Geoff G. X. Wang is the Guest Editor of the special issue on clean energy and environmental technologies

Dr. Geoff Wang received his B.Eng in 1983, M.Eng in 1986 and Ph.D in 1989 from Northeastern University of China and specialized in process metallurgy focusing on iron- and steel-making. He worked in Wuhan Iron and Steel University (currently the Wuhan University of Science and Technology) as Lecturer, Associate Professor during 1989–1996. He was a member of Board of Directors of the Iron-making Branch of the Chinese Society for Metal (CSM). Before joining the University of Queensland in 1996. He was a visiting professor at the School of Materials Science and Engineering at the University of New South Wales in 1995. He has significantly contributed to the research area of chemical and metallurgical sciences and engineering, energy and environmental technologies, including coal utilization, ironmaking technology, coalbed methane development, and carbon dioxide capture and CO₂ sequestration. He is author of a monograph and has over 100 original journal publications and about 60 refereed conference papers, including a patent. He has been appointed as a Guest Professor of China University of Mining and Technology since 2006 and a Visiting Professor of Henan Polytechnic University since 2010.

Dr. Geoff Wang is currently Deputy Director of the Baosteel-Australia Joint Research and Development Center, a world-first joint venture between Basoteel - one of the world's largest steel companies, and four Australian universities. The centre was established in April 2011. It seeks to create an enduring collaboration between Baosteel and four leading Australian universities, the University of Queensland, University of New South Wales, Monash University and University of Wollongong, to conduct research and to provide innovative technologies in areas of interest to Baosteel.