

# **Green Technologies for Sustainable Water Management**

Edited by  
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# Preface

The consumption and degradation of our limited water resources has not only brought numerous challenges to our safe water supply but also various adverse impacts on the environment. These challenges and environmental problems are the main impetus for promoting green technologies to ensure our own well-being in the future as well as preserve the environment for a better tomorrow. Thus, in terms of sustainable water management, the main strategies are directed toward developing environmental-friendly, economically viable and energy effective treatment processes, which have higher removal efficiency of pollutants and possible nutrient recovery while enabling to reduce carbon footprint, minimize waste production and protect human and environmental health.

According to United Nations Environment Programme, “Green technology covers a broad area of production and consumption technologies. The adoption and use of green technologies involves the use of environmental technologies for monitoring and assessment, pollution prevention and control, resource and energy recovery, mitigation of climate change, and remediation and restoration.”

Nowadays, increasing environmental awareness has driven new insights into the competing factors for water and wastewater treatment technology such as energy consumption, use of hazardous chemicals, health impacts, waste generation, sludge handling and disposal. The purpose of this book is to elucidate basic scientific principles and technological advances of current green technologies for sustainable water management. Solutions to pressing all concerned problems associated with energy optimization during wastewater treatment, the possibility of wastewater as a possible resource, health impacts of treatment technology due to the release of trace organic contaminants and prevention of surface water pollution, are presented in this book.

This 28-chapter book consists of three themes: 1) green technologies for water and wastewater management; 2) green technologies for pollution prevention/control and remediation/restoration; and 3) green technologies toward sustainable society. These three themes are linked by the central thread of sustainable water and wastewater management.

We hope that this book will be of interest to researchers, students, scientists, engineers, government officers, process managers and practicing professionals. As an excellent state-of-the-art reference material, the book will contain rich knowledge on the principles and provide them in-depth understanding and comprehensive information of current green technologies, their different environmental applications, recent advantages and disadvantages, critical analysis and modeling

of the processes, and future perspective toward research directions and development.

The editors gratefully acknowledge the hard work and patience of all the authors who have contributed to this book. The views or opinions expressed in each chapter of this book are those of the authors and should not be construed as opinions of the organizations they work for.

***Huu Hao Ngo, Wenshan Guo, Rao Y. Surampalli,  
and Tian C. Zhang***

# About the Editors

**Dr. Huu Hao Ngo** is a Professor in School of Civil and Environmental Engineering at the University of Technology Sydney (UTS), Australia. He received his Ph.D. in Environmental Engineering from UTS in 1995. His research involves wastewater treatment and reuse technologies, especially advanced biological waste treatment technologies (membrane bioreactor, specific attached and/or suspended growth bioreactors, biomass and biosorption), membrane technologies and physical-chemical separation technologies as pretreatment or post-treatment. His expertise and practical experience also covers solid waste management and desalination. Currently, his activities more focus on developing specific green technologies: water-waste-bioenergy nexus and greenhouse gas emission control. He is also an Honorary Professor/Adjunct Professor and International Chair Professor of numerous universities in China, Taiwan and Vietnam. He was awarded the fellowship of Australian Academy of Science (AAS) - Korean Science and Engineering Foundation, AAS - Science and Japan Society for the Promotion of Science, and AAS - French Embassy. He is a one of the founders of the Joint Membrane Bioreactor Centre (UTS, Tongji University and Tianjin Polytechnic University). Being a member of global professional societies (ACS, IWA, AWA, EDS), he is also a Council Member of International Forum on Industrial Bioprocess, Managing Committee Member of IWA Working Group on Alternative Water Resources (China), key member of the International Science & Technology Cooperation Center for Urban Alternative Water Resources Development, XAUAT and Advisory Committee Member of Tianjin Engineering Center of Biomass-derived Gas/Oil Technology. Ngo has published more than 300 peer-reviewed journal articles, 2 books and 19 book chapters. He is an Editor of *Bioresource Technology*, Elsevier and also a founder and Editor in Chief of *Journal of Water Sustainability* while being editorial board member of numerous international journals such as *Science of the Total Environment*, Elsevier, *Environmental Nanotechnology, Monitoring and Management*, Elsevier, *Journal of Energy and Environmental Sustainability*, ISES etc.

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**Dr. Tian C. Zhang, P.E., D.WRE, BCEE, F.ASCE, A.EASA, F.AAAS** is a Professor in the department of Civil Engineering at the University of Nebraska-Lincoln (UNL), USA. He received his Ph.D. in environmental engineering from the University of Cincinnati in 1994. He joined the UNL faculty in



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