Editorial

Green technologies for sustainable environment: an introduction

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Water pollution has long been a major source of concern for the environment, the biosphere, and human well-being. In order to safeguard the environment, technologies such as wastewater treatment, reuse, recycling, and resource recovery have been tested and implemented at the pilot and industrial scales. In recent years, the research hotspot of environmental protection has gradually shifted from the well-known conventional technologies to eco-friendly, cost-effective, and sustainable technologies, also known as green technologies which could demonstrate outstanding advantages. Several practical treatment processes have been proposed and applied in practice; however, the green technologies are currently the most attractive for pollution control, especially water and wastewater remediation, preventing air pollution, and also the development of sophisticated, yet usable on-site sensors and analytical instruments. In the context of environmental protection, green technologies are a collection of practical methodologies, techniques, technologies, and materials that are based on non-toxic chemical processes, non-toxic end products, renewable energy sources, and environmental monitoring instruments, among other things, to mitigate or correct the negative impact caused by human activities.

Firstly, concerning water quality, an effective arithmetical method for evaluating the quality of surface and ground water has been described as the water quality index (WQI). The determination of water quality indexes often entails the integration of diverse biological, physical, and chemical aspects of a water source to yield a single value that is unitless but serves as an effective indicator of water quality because it is non-destructive. Secondly, the increased consumption of fossil fuels contributes to global warming, depletion of fossil fuel reserves, and future energy insecurity, all of which encourage the globe to look for alternatives that are more environmentally friendly, simple, and inexpensively available. Thirdly, in many water bodies around the globe, toxic cyanobacterial blooms (TCBs) are becoming a rising source of worry and it has depleted the water quality. By using modern analytical and quantitative real-time polymerase chain reaction (qPCR) and high-performance liquid chromatography (HPLC) techniques, the dynamics of poisonous cyanobacteria and microcystin (MC) concentrations in different aquatic ecosystems can be

determined. Fourthly, the recovery of energy from plastic wastes has become increasingly popular in recent decades, owing to the increased need for energy in the world. The green principles and concepts such as recycling and reusing are being considered as an alternative, but reprocessing plastics and subjecting them to additional heating cycles will almost certainly result in molecular damage such as cross-linking, chain scission, or the formation of double bonds, which will reduce the product's reliability. Fifthly, when we discuss the global issue of climate change, the levels of carbon dioxide in the earth's atmosphere are increasing on a daily basis as a result of the combustion of fossil fuels for the generation of electricity. This has caused greenhouse gas (GHG) emissions, accounting for 64% of global warming since the industrial revolution. From a techno-economic and green technology viewpoint, researchers have been more interested in novel carbon capture because of its ease of integration with coal-fired power plants, which does not require considerable adjustments (e.g., the use of photobioreactors, photo-sequencing bioreactors, and algal bioreactors). All these five issues have led to the development of an enormous number of indicators that aims at pollution prevention, resource recovery, and the implementation of cleaner production concepts by a variety of national and international entities/research groups.

On December 1–4, 2019, the 2nd Green Technologies for Sustainable Water Conference (GTSW 2019) was successfully held in Ho Chi Minh City, Viet Nam. The aim of GTSW 2019 was to provide a special forum for exchanging experiences, knowledge, and innovative ideas on all aspects of green technologies, with seven main themes: (1) water and wastewater treatment by green technologies, (2) wastewater treatment and reuse, (3) membrane processes, (4) resources recovery from wastewater, (5) nanotechnology for biological waste treatment, (6) bio-processes and bio-products, and (7) disruptive technologies and the application for water resource treatment and management. A wide range of present and future development difficulties in the fields of green technologies for waste to energy conversion, the resource recovery in the form of energy, fuel, valuable products and chemicals, and resilient environmental technologies were addressed by the keynote speakers, all of whom were speaking in a worldwide context.

The outcomes of GTSW 2019 were an opportunity to discuss and assess the latest approaches, innovative technologies, policies, and new directions in infrastructure development, pollution prevention, and eco-friendly processes to promote cooperation and networking amongst practitioners and researchers involved in addressing Green Technologies for Sustainable Water. The papers published in this special edition will provide significant networking opportunities for professionals and will provide the groundwork for future collaboration among these individuals. We are grateful to Prof. Philippe Garrigues, the Editor-in-Chief of Environmental Science and Pollution Research (ESPR), for providing us with the chance to publish a selection of peer-reviewed papers that were presented at GTSW 2019, and we appreciate him for his support. We would like to express our gratitude to Ms. Fanny Creusot and Ms. Florence Delavaud, Editorial Assistants of ESPR, as well as the

entire Springer production team, for their invaluable assistance in bringing this issue to a successful conclusion. The guest editors are confident that the papers in this special issue will be useful reading materials for your study group, and we wish you the best of luck in your endeavors.

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