

Special issue on the 4th International Conference on the “Challenges in Environmental Science & Engineering”, CESE-2011: solutions to environmental challenges through the application of advanced technologies

Veeriah Jegatheesan · Li Shu · Jurate Virkutyte ·
Chart Chiemchaisri

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“Challenges in Environmental Science & Engineering”, CESE International Conference Series is an annual event initiated by Associate Professor Jega V. Jegatheesan and Dr. Li Shu both of whom are currently attached to Deakin University, Australia. Researchers, policy-makers, academics, students and the broader community active in contributing solutions to the myriad of environmental questions posed by the challenges facing environmental sustainability are the consistent participants of CESE series.

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The CESE Series aims at making significant contribution to “Sustainable Growth” and this could only be possible if scientists and engineers were worked together. This will pave way for further interactions with other stakeholders who are as important as the previous two to find ways for complete solutions. Sustainable growth could only be achieved if the complex interactions among many processes were understood and the sustainability is considered simultaneously in all those processes. Sustainability of fresh water and other resources as well as energy should be emphasized for sustainable growth. Better management of catchments and cleaner production are important criteria for the sustainability of fresh water and other resources. Sustainability of energy depends on innovative applications of renewable energy sources.

In this special issue, two advanced technologies namely membranes and nano-particles are highlighted through some of their specific applications. Membranes are used for separations of solid–liquid, liquid–liquid, liquid–gas and gas–gas phases. Membranes are mainly characterized by their pore sizes and applied pressures. Type of material will also play a significant role in their applications. For example, separation at high temperatures will need membrane materials that

V. Jegatheesan (✉) · L. Shu
School of Engineering, Deakin University,
Geelong, Australia
e-mail: jega.j@deakin.edu.au

L. Shu
e-mail: l.shu@deakin.edu.au

J. Virkutyte
Pegasus Technical Services Inc., Cincinnati,
OH 45216, USA
e-mail: Virkutyte.Jurate@epa.gov

C. Chiemchaisri
Department of Environmental Engineering,
Faculty of Engineering, Kasetsart University Bangkok,
Bangkok, Thailand
e-mail: fengccc@ku.ac.th

could withstand such temperatures. Applications of nano-particles in consumer products as well as in various industries have increased significantly. Manufacturing those nano-particles through efficient methods has become research interest to many scientists and engineers.

There are four articles in this issue and the first article considers the application of microfiltration and ultra-filtration in clarifying sugar cane juice. Improved efficiency in clarification could eliminate the clarifier from the process as well as improve the quality of juice through the removal of macromolecules such as proteins and starch. This would help to improve the production capacity of sugar with better crystallization. The second article discusses the pre-treatment processes that are required if secondary wastewater effluent has to be treated by reverse-osmosis (RO) membranes. Bio-fouling of reverse osmosis membrane is a critical issue when secondary wastewater effluent is treated as it is rich in carbon, nitrogen, phosphorus and other micronutrients that are necessary for the biological growth on RO membrane surface. The third article explores the novel application of membrane in forward osmosis mode. When

appropriate membranes with very concentrated draw solutions placed on one side of the membrane will draw water from the other side of the membrane, where feed solution is placed; this is due to the osmotic pressure difference between those two sides. This application does not need any applied pressure and therefore would save significant amount of energy. Thus, the third article describes how the forward osmosis could be applied to produce fertilizer solutions using fertilizers as draw solutions and concentrates from sea water RO as feed solutions. The fourth article deals with the synthesis of silver and gold nano-particles through the mediation of plants. The article discusses the synthesis of nano-particles (chemical, physical and biological) and justifies the importance of biological synthesis over the others. It also describes the mechanisms of plant-mediated synthesis of nano-particles followed by the compounds responsible for the synthesis and factors such as pH, temperature and composition of reactants that affect the type, size and shape of nano-particles. Applications of silver and gold nano-particles are also described. We hope this special issue adds to the existing knowledge in the relevant research areas.