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Emerging Technologies and Advanced Techniques for Waste Treatment and Energy Production

1st Edition

Editors

Prof. Ramasamy Subbaiya

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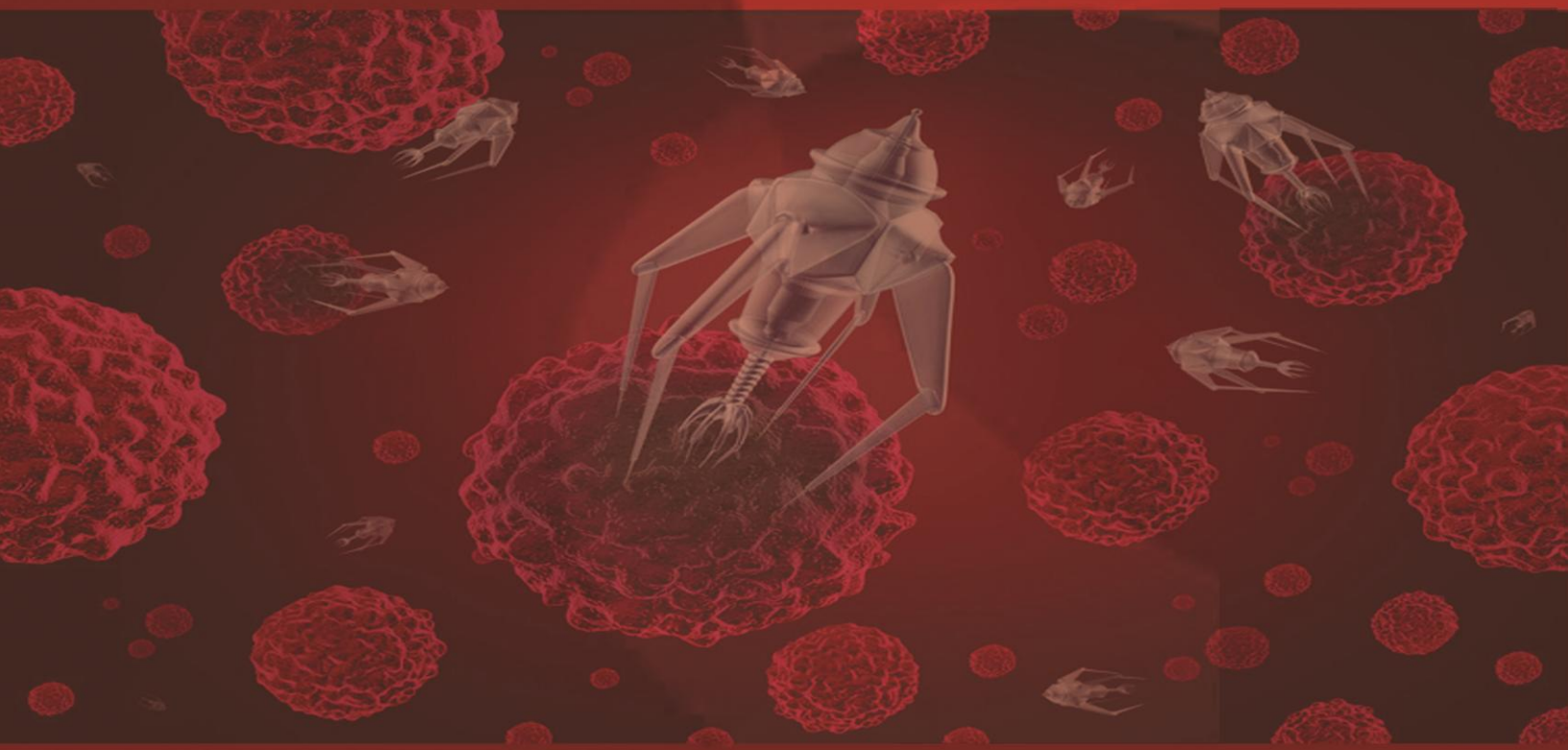

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Table of Contents

Preface

Wastewater treatment facilities use up to 5% of the world's energy, although only 25% of those plants effectively clean the water they utilize. Imagine the possibilities if the remaining 85% of the world's untreated water was treated in a manner that allowed the plants to generate electricity from the wastewater while also sufficiently treating the water. Coal-fired power plants in developed nations might all be shut down if wastewater treatment facilities started producing their own energy instead of using it, according to research studies. The collection of solid sludge is the first step in the treatment process for wastewater in sewage treatment plants. This sludge then goes through a pretreatment process known as thermal hydrolysis in a system that converts sludge to energy in order to increase the quantity of methane that it is able to generate. After that, the trash that has been treated goes into an anaerobic digester, which completes the process of breaking it down. The end result is a methane-rich gas known as biogas, which may be used to satisfy the facility's immediate energy requirements, or it can be refined further and used in lieu of natural gas.Even though it's a mouthful to say, "bioelectrochemistry" is a term you should get acquainted with if you're interested in environmentally friendly and resource-conserving methods of treating wastewater from industrial processes.The process involves bacteria with specialized abilities, such as producing and consuming power while treating and detecting contaminants in wastewater. Microbial fuel cells (MFCs) have received a lot of interest in recent decades because they can employ biodegradable substrates as fuel under very benign working conditions. In more recent years, scientists have shown that this is a foundation for technological development, which expands the potential uses of MFCs considerably. In wastewater treatment facilities, MFCs may be used to decompose organic matter and generate energy; they have also been studied for other potential uses, such as biosensors and in the biohydrogen processing industry. In order to conserve energy and deal with environmental challenges, MFCs have been acknowledged as an interesting and challenging technology for parallel wastewater treatment. MFCs have shown to be a workable strategy for reducing the need for chemical oxygen while also generating electricity. Power generated from renewable resources such as the biowaste and biomass is infinite in supply. Renewable sources of energy may be used to power electric generators, heat and cool buildings and water, and power vehicles. In contrast, nonrenewable energy sources like fossil fuels are limited and eventually depleted.Numerous sectors, including the economy, ecology, national security, and human health, benefit from the use of renewable

energy sources. Some advantages of renewable energy use in the developed countries are listed such as increased grid security, safety, and resilience; Employment opportunities in the renewable energy sector, lowered energy-related air pollution and carbon emissions, greater accessibility, since many forms of renewable energy now compete on price with more conventional ones, Increased availability of renewable energy sources in outlying areas and on islands without access to the traditional power system.

This book represents cutting-edge waste treatment and renewable energy generation technologies, as well as the usage and creation of renewable energy from biowaste, affect the efficacy of treatment technologies. Thermochemical treatment procedures such as incineration, pyrolysis, and gasification are effective for wastes with low organic content and moisture levels. When compared to other waste treatment methods, anaerobic digestion stands out as the best option for nations still working to improve their infrastructure. It is only necessary to promote these technologies on a bigger scale with the aid of Government subsidies, programmers, and laws because of their proven environmental friendliness, efficiency, and economy. Growing public understanding of the need of sustainable waste management is also essential.

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R. Subbaiya Ph.D., is working as an Associate Professor in the Department of Biological Sciences, School of Mathematics and Natural Sciences, The Copperbelt University, Kitwe, Zambia. His research interests include Microbiology, Nanobiotechnology, Biogas, Biofuel, Bioenergy and Waste Management. He is having more than 15 years of Teaching Experience. To his credit, He has Received a **"Young Scientist Award"** from "Tamil Nadu State Council for Science and Technology", Chennai, India in the year of 2011and he had received **"Outstanding Best Paper Award"** from "Nature Science Foundation, Coimbatore" for the Research paper entitled "Synthesis of bioactive compounds from vermicast isolated actinomycetes species and its antimicrobial activity against human pathogenic bacteria" *Microbial Pathogenesis*. (2018), In addition to that he has received **"The IET Premium Awards 2019"** for the Research paper entitled "Biomimetic synthesis of silver nanoparticles from *Streptomyces atrovirens* and their potential anticancer activity against human breast cancer cells", *IET-Nanobiotechnology*. He had received the funded projects from AICTE and DST-NIMAT. He had filed two Indian patents and published more than 78 Research and Review articles in reputed journals with a cumulative impact factor of above 300 and published 10 Book chapters to his credit. He is serving as a Reviewer for several Indexed Journals. Presented papers and attended more than 30 National and International Conferences. He is also a life member of Society for Biotechnology and Indian Lichenological Society, Life Member in Indian Society for Technical Education (ISTE).

S. Manikandan Ph.D., is working as an Assistant Professor and Head of the Department of Biosciences, Saveetha School of Engineering, SIMATS, Chennai, Tamil Nadu, India. He was awarded by the University Merit Certificate and was designated as a Recognized Supervisor for MS/Ph.D. by a reputable University (Anna University). Dr. Manikandan has extensive scientific experience, has filed patents, and has worked on DST, DRDO, and Nanomission supported projects. He obtained a high percentile on the GATE-2011 in Biotechnology. He had spent the last 12 years by working in the fields of nanotechnology, nanofluids, and tissue engineering, and he had published more than 50 National and International articles with a cumulative impact factor of 300 and published 3 book chapters to his credit.