

Emerging Compounds Removal From Wastewater Natural And Solar Based Treatments Springerbriefs In Molecular Science

This volume offers a detailed overview of currently applied and tested wastewater treatment technologies and the integration of advanced processes to remove trace organic contaminants and microorganisms. It discusses the potential of enhanced biological treatment to produce effluent suitable for reuse, new processes for urban wastewater disinfection and the reduction of antibiotic resistant bacteria, as well as the effect of advanced oxidation processes on wastewater microbiome and chemical contaminants. It also presents membrane bioreactors, moving bed bioreactors, light and solar driven technologies, ozonation and immobilised heterogeneous photocatalysis and provides an evaluation of the potential of constructed wetlands integrated with advanced oxidation technologies to produce wastewater safe for reuse. Furthermore, the volume discusses water reuse issues and standards, the status of membrane bioreactors applications, and the treatment of reverse osmosis concentrate for enhanced water recovery during wastewater treatment. Finally, it presents recent developments in potable water reuse and addresses various important issues in this framework, like the proper protection of public health, reliability and monitoring. This volume is of interest to experts, scientists and practitioners from various fields of research, including analytical and environmental chemistry, toxicology and environmental and sanitary engineering, as well as treatment plant operators and policymakers.

This book discusses new and innovative trends and

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techniques in the removal of toxic and or refractory pollutants through various environmental biotechnological processes from wastewater, both at the laboratory and industrial scale. It focuses primarily on environmentally-friendly technologies which respect the principles of sustainable development, including the advanced trends in remediation through an approach of environmental biotechnological processes from either industrial or sewage wastewater. Features: Examines the fate and occurrence of refractory pollutants in wastewater treatment plants (WWTPs) and the potential approaches for their removal. Highlights advanced remediation procedures involving various microbiological and biochemical processes. Assesses and compares the potential application of numerous existing treatment techniques and introduces new, emerging technologies. Removal of Refractory Pollutants from Wastewater Treatment Plants is suitable for practicing engineers, researchers, water utility managers, and students who seek an excellent introduction and basic knowledge in the principles of environmental bioremediation technologies. Emerging Membrane Technology for Sustainable Water Treatment provides the latest information on the impending crisis posed by water stress and poor sanitation, a timely issue that is one of the greatest human challenges of the 21st century. The book also discusses the use of membrane technology, a serious contender that can be used to confront the crisis on a global scale, along with its specific uses as a solution to this escalating problem. Provides a unique source on membrane technology and its application for water treatment Focuses on technologies designed for the treatment of seawater and brackish water Highlights the most economically and environmentally friendly membrane technologies Lists various technologies and emphasizes their link to renewable energy, energy efficiency, nanotechnology, reuse, and recycle

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The book on Physico-Chemical Treatment of Wastewater and Resource Recovery provides an efficient and low-cost solution for remediation of wastewater. This book focuses on physico-chemical treatment via advanced oxidation process, adsorption, its management and recovery of valuable chemicals. It discusses treatment and recovery process for the range of pollutants including BTX, PCB, PCDDs, proteins, phenols, antibiotics, complex organic compounds and metals. The occurrence of persistent pollutants poses deleterious effects on human and environmental health. Simple solutions for recovery of valuable chemicals and water during physico-chemical treatment of wastewater are discussed extensively. This book provides necessary knowledge and experimental studies on emerging physico-chemical processes for reducing water pollution and resource recovery.

Water is accepted as the most important source of life. It is assumed that life began in water and spread from there to the whole world. But water has been polluted anthropogenically since the beginning of the industrial revolution in the late 19th century. At the end of the 20th century, most water sources cannot be used for aquaculture, irrigation, and human use. Therefore, for sustainable development, we have to protect our water sources on Earth, because it's the only planet we have!

Emerging Compounds Removal from Wastewater Natural and Solar Based Treatments Springer Science & Business Media Management of Contaminants of Emerging Concern (CEC) in Environment provides information about new concepts and latest developments in origin, reaction pathways, transportation, transformation products, identification, and adverse effects of CEC, as well as recent remediation technologies and tools for CEC. The book explores processes such as nanotechnology for the degradation of CEC by using various heterogeneous catalysts. The chapters incorporate

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both theoretical and practical aspects and can serve as a baseline for future studies. So, Management of Contaminants of Emerging Concern (CEC) in Environment is an indispensable resource for university students, teachers, and researchers, especially those working in the area of remediation and management of contaminants of emerging concern. Takes a holistic approach, focusing on the origin of contaminants, type of contaminants, remediation technologies, regulations and legal aspects Applies chemical, physical and biological processes for the treatment of emerging contaminants Written by a team of internationally reputed and rising researchers

The abundance of organic pollutants found in wastewater affect urban surface waters. Traditional wastewater management technologies focus on the removal of suspended solids, nutrients and bacteria, however, new pollutants such as synthetic or naturally occurring chemicals are often not monitored in the environment despite having the potential to enter the environment and cause adverse ecological and human health effects. Collectively referred to as "emerging contaminants," they are mostly derived from domestic activities and occur in trace concentrations ranging from pico to micrograms per liter. Environmental contaminants are resistant to conventional wastewater treatment processes and most of them remain unaffected, causing contamination of receiving water. This in turn leads to the need for advanced wastewater treatment processes capable of removing environmental contaminants to ensure safe fresh water sources. This book provides an up-to-date overview of the current bioremediation strategies, including their limitations, challenges and their potential application to remove environmental pollutants. It also introduces the latest trends and advances in environmental bioremediation, and presents the state-of-the-art in biological and chemical

wastewater treatment processes. As such, it will appeal to researchers and policy-makers, as well as undergraduate and graduate environmental sciences students.

Coagulation and Flocculation in Water and Wastewater Treatment provides a comprehensive account of coagulation and flocculation techniques and technologies in a single volume covering theoretical principles to practical applications. Thoroughly revised and updated since the 1st Edition it has been progressively modified and increased in scope to cater for the requirements of practitioners involved with water and wastewater treatment. A thorough gamut of treatment scenarios is attempted, including turbidity, color and organics removal, including the technical aspects of enhanced coagulation. The effects of temperature and ionic content are described as well as the removal of specific substances such as arsenic and phosphorus. Chemical phosphorus removal is dealt with in detail, Rapid mixing for efficient coagulant utilization, and flocculation are dealt with in specific chapters. Water treatment plant waste sludge disposal is dealt with in considerable detail, in an Appendix devoted to this subject. Invaluable for water scientists, engineers and students of this field, Coagulation and Flocculation in Water and Wastewater Treatment is a convenient reference handbook in the form of numerous examples and appended information.

The use of synthetic chemical dyes in various industrial processes, including paper and pulp manufacturing, plastics, dyeing of cloth, leather treatment and printing, has increased considerably over the last few years, resulting in the release of dye-containing industrial effluents into the soil and aquatic ecosystems. The textile industry generates high-polluting wastewaters and their treatment is a very serious problem due to high total dissolved solids (TDS), presence of toxic heavy metals, and the non-biodegradable nature of the dyestuffs in the effluent. The chapters in this book provide an overview of the problem and its solution from different angles. These problems and solutions are presented in a genuinely holistic way by world-renowned researchers. Discussed are various promising techniques to remove dyes, including the use of nanotechnology, ultrasound, microwave, catalysts, biosorption, enzymatic treatments, advanced oxidation processes, etc., all of which are “green.” Green Chemistry for Dyes Removal from Wastewater comprehensively discusses: Different types of dyes, their working and methodologies and various physical, chemical and biological treatment methods employed Application of advanced oxidation processes (AOPs) in dye removal whereby highly reactive hydroxyl radicals are generated chemically, photochemically and/or by radiolytic/ sonolytic means. The potential of

ultrasound as an AOP is discussed as well.

Nanotechnology in the treatment of dye removal types of adsorbents for removal of toxic pollutants from aquatic systems Photocatalytic oxidation process for dye degradation under both UV and visible light, application of solar light and solar photoreactor in dye degradation

Over the last 15 years, the focus of chemical pollution has shifted from conventional pollutants to so-called “emerging” or “new”

unregulated contaminants. These include pharmaceuticals and personal care products, hormones, UV filters, perfluorinated compounds, polybrominated flame retardants (BFRs), pesticides, plasticizers, artificial sweeteners, illicit drugs, and endocrine disruptor compounds (EDCs). Despite the increasing number of published studies covering emerging contaminants, we know almost nothing about the effects of their transformation products and/or metabolites. This two-volume set provides a unique collection of research on transformation products, their occurrence, fate and risks in the environment. It contains 32 chapters, organised into 7 parts, each with a distinct focus: • General Considerations • Transformation Processes and Treatment Strategies • Analytical Strategies • Occurrence, Fate and Effects in the Environment • Global Speciality and Environmental Status • Risk Assessment, Management and Regulatory

Framework • Outlook Transformation Products of Emerging Contaminants in the Environment is a valuable resource for researchers and industry professionals in environmental chemistry, analytical chemistry, ecotoxicology, environmental sciences, and hydrology, as well as environmental consultants and regulatory bodies.

This book presents a picture of the advances in the research of theoretical and practical frameworks of wastewater problems and solutions. The book deals with a basic concept and principles of modern biological, chemical and technical approaches to remediate various hazardous pollutants from wastewater. The latest empirical research findings in wastewater treatment are comprehensively discussed. Examples of low-cost technologies are also included. The book is written for professionals, researchers, academics and students wanting to improve their understanding of the strategic role of environmental protection and advanced applied technologies.

This book describes how psychiatric pharmaceuticals, namely antidepressants, anxiolytics, sedatives and hypnotics are among the most prescribed active substances due to the higher occurrence of psychiatric disorders throughout the world. It goes on to demonstrate how patients' excretion of the active compounds along with several metabolites is considered to be the main pathway for

the occurrence of these emerging pollutants in wastewater treatment plant effluents, surface and drinking water, soils and sediments. Further chapters are devoted to an exploration of these pharmaceuticals' high persistence, toxicity and intrinsic biological activity, which can affect the nervous and endocrine systems of terrestrial and aquatic non-target organisms, the dissemination of these compounds in environment matrices and the growing number of associated problems and concerns. The remainder of the book describes how conventional wastewater treatment processes are generally inefficient when it comes to the removal of this type of pollutants, giving rise to the demand for implementing alternative or complementary treatment technologies. Extensive research studies on the efficiency of the degradation and/or removal of these pollutants are summarized, and adsorption, membrane and advanced oxidation processes (AOP) are proposed. Given its content and structure, the book offers a concise summary of the most significant findings on psychiatric pharmaceutical removal in wastewater.

In order to analyse the challenges posed by the quest for sustainability, *Green Technologies for Wastewater treatment: Energy Recovery and Emerging Compounds Removal* evaluates water management together with energy use. The strong effects that the release of emerging pollutants such

as endocrine disruptors (EDCs), pharmaceuticals and personal care products (PPCPs) have in wastewater reuse applications are examined, as well as the need to optimize the energy consumption in wastewater treatment. More specifically, this volume focuses on: - Presenting the advantages linked to the application of chemically assisted primary sedimentation (CAPS) that enables energy optimization of wastewater treatment plants and points to the possibility of wastewater as a possible resource; - Discussing the analytical problems related to the analytical detection of emerging pollutants and of their transformation products; - Comparing the efficiency of MBR plants for removing trace pollutants with conventional systems; - Evaluating the application of Wet Oxidation (WO) for the treatment of aqueous effluents to remove trace pollutants; - Reviewing the application of Photo-Fenton process and complementary treatment systems (H₂O₂/UV-C and Fenton's reagent) for the degradation of two industrial pollutant categories with significant endocrine disrupting properties: alkyl phenols (nonyl and octyl phenols) and bisphenol A.

Green Technologies for Wastewater treatment: Energy Recovery and Emerging Compounds Removal will be of great interest to students, technicians, and academics alike who are interested in evaluating and selecting the technologies that lead to better and more sustainable treatment of these

huge classes of pollutants.

Removal of Emerging Contaminants from Wastewater through Bio-nanotechnology showcases profiles of the nonregulated contaminants termed as “emerging contaminants, which comprise industrial and household persistent toxic chemicals, pharmaceuticals and personal care products (PPCPs), pesticides, surfactants and surfactant residues, plasticizers and industrial additives, manufactured nanomaterials and nanoparticles, microplastics, etc. that are used extensively in everyday life. The occurrence of “emerging contaminants in wastewater, and their behavior during wastewater treatment and production of drinking water are key issues in the reuse and recycling of water resources. This book focuses on the exploitation of Nano-biotechnology inclusive of the state-of-the-art remediate strategies to degrade/detoxify/stabilize toxic and hazardous contaminants and restore contaminated sites, which is not as comprehensively discussed in the existing titles on similar topics available in the global market. In addition, it discusses the potential environmental and health hazards and ecotoxicity associated with the widespread distribution of emerging contaminants in the water bodies. It also considers the life cycle assessment (LCA) of emerging (micro)-pollutants with suitable case studies from various industrial sources. Provides natural and

ecofriendly solutions to deal with the problem of pollution Details underlying mechanisms of nanotechnology-associated microbes for the removal of emerging contaminants Describes numerous successful field studies on the application of bio-nanotechnology for eco-restoration of contaminated sites Presents recent advances and challenges in bio-nanotechnology research and applications for sustainable development Provides authoritative contributions on the diverse aspects of bio-nanotechnology by world's leading experts

Organochlorines (OC) are organic molecules with chlorine in their structure. There is a large number of organochlorine compounds known. Large amounts of chlorinated organic compounds are produced for industrial, agricultural, pharmaceutical, household purposes, etc. In many studies, the main focus is on OC that have been evaluated as environmental contaminants with toxic effects on humans. Different types of organochlorines have been produced throughout the world. Some of the most popular classes are organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs), dioxins, chlorobenzenes, chlorophenols, chlorinated alkanes, etc. Organochlorine compounds are very stable. Generally, they are molecules of moderate polarity (low solubility in water). This makes OCs easily soluble in fats. They are found in almost all environments: air, water, soil, sediments and biota

samples. They can spread out easily in different geographic altitudes and latitudes. Volatile and semi-volatile OCs have the ability to travel far distances from the place where they were used. Some studies have reported some organochlorines in the North Pole at the same levels as the areas where they were produced or applied. They have the ability to bioaccumulate easily in biota. Passing through the food chain levels, they increase their concentrations (biomagnifying). The main access pathways for OCs to the human body are through foods and exposures. Generally, they display their effects after a relatively long period of exposure. This is the main reason why they were produced and used for a long time before their production and use was banned.

The most important health effects that organochlorines can cause are: mutagenic, endocrine-disruptor, carcinogenic and central nervous or peripheral disorders. After identification of the consequences, production of OCs and use was banned in many countries but their effects are still being seen many years later.

Emerging contaminants are chemical and biological agents for which there is growing concern about their potential health and environmental effects. The threat lies in the fact that the sources, fate and toxicology of most of these compounds have not yet been studied. Emerging contaminants, therefore, include a large number of both recently discovered and well-known compounds such as rare earth elements, viruses, bacteria, nanomaterials, microplastics, pharmaceuticals,

endocrine disruptors, hormones, personal care products, cosmetics, pesticides, surfactants and industrial chemicals. Emerging contaminants have been found in many daily products, and some of them accumulate in the food chain. Correlations have been observed between aquatic pollution by emerging contaminants and discharges from wastewater treatment plants. Most actual remediation methods are not effective at removing emerging contaminants. This second volume presents comprehensive knowledge on emerging contaminants with a focus on remediation.

In the last decades, the scientific community has been involved in the research of new kinds of contaminants generally known as of "emerging concern" (CECs). The harmfulness of CECs, even at small concentrations as well as, property of bioaccumulation and persistence, makes them extremely dangerous for the human health. The scientific community is constantly researching about novel treatments able to achieve the removal of these contaminants. Advanced Oxidation Processes (AOPs) are considered one of the most useful treatments to achieve CECs degradation. Among the AOPs, Fenton and photo-Fenton processes are particularly powerful, cheap and easily managed. Nevertheless, some setting requirements of Fenton processes have limited their application at industrial scale. One of the most important limits is the necessity to operate a tight control of the pH in order to avoid iron precipitation (optimum pH?2.8).

Unfortunately, the optimum pH for Fenton reaction is essentially far from the normal values of the wastewater treatment plant (WWTP) effluents. Scientific community is then working on the improvement of the operating conditions of Fenton processes in order to improve the applicability in wastewater treatment. These modifications are essentially focused on the possibility to perform the treatment at circumneutral pH (Fenton and photo- Fenton like processes).

Fenton like processes can be carried out in heterogeneous or homogeneous way according to the phase of the catalyst into the solution. In this study was firstly confirmed the suitability of Fenton based processes in recalcitrant compounds removal. Fenton, UV-A photo-Fenton and UV-C photo-Fenton were, in fact, applied for atrazine removal from secondary effluent (SE) of municipal wastewater treatment plant (MWWTP). UV-A and UV-C photo-Fenton allowed remove 50% and 100% of the initial atrazine content respectively. The main objective of this thesis was then the assessment of photo-Fenton's suitability for recalcitrant contaminant at circumneutral pH. Thus, homogeneous photo-Fenton like at neutral pH was applied for sulfamethoxazole (SMX) removal. In order to avoid iron precipitation, chelating agents were used to keep soluble the iron at circumneutral pH. The chelating ability of four chelating agents (ethylenediaminetetraacetic acid-EDTA, nitrilotriacetic acid-NTA, oxalic acid and tartaric acid) was tested. Then, once determined the optimum molar ratio L:Fe for iron chelation (1.5:1 for EDTA and NTA, 10:1 for tartaric acid and 20:1 for oxalic acid), their catalytic activity was evaluated when employed in photo-Fenton like for SMX removal. The highest SMX percentage removal, together with the minimum chelating agents required and the better property of biodegradability and low toxicity, demonstrated the suitability of NTA for the purpose. A further study on the stability of the chelates under reaction was carried out. The operating conditions adopted for the treatment significantly influence the stability of the chelate solution. Thus, in order to proper control the parameter set up the behavior of chelates has been study under thermal, oxidative and photochemical stress. It was demonstrated as the temperature control can represent an interesting tool to extend the chelates lifetime under oxidative and photochemical stress. By adopting

different H₂O₂ doses, a linear correlation between doses and chelate decomposition could be identified. The better suitability of UV-A irradiation, against UV-C and Xe lamp, to preserve the iron chelate solution was demonstrated. Moreover, the influence of the influent characteristics on the process efficiency needed to be also considered. Thus, different water matrices were used for the experiments. The efficiency of photo-Fenton like catalyzed by Fe(III)-NTA has been compared when applied to different aqueous matrixes (Milli-Q water, tap water, secondary effluent wastewater and well water). It was demonstrated as the ions content, especially Ca²⁺ and Mg²⁺, significantly compromise the process of chelation. High alkalinities and organic matter, instead, mainly influenced the phase of process, when acting as radicals scavengers, reduced the amount available for SMX oxidation. Some strategies were then adopted to promote SMX removal. Between them, Mn²⁺ mediated photo-Fenton like showed somehow possibility for improvement. Highest removal rate was in fact exhibited in the first minutes of reaction when adding Mn²⁺ to the solution in ratio molar Mn:Fe 0.5:1. The conclusive study of the thesis regarded the assessment of the Br⁻ presence on the efficiency achievable in recalcitrant compounds removal when applying UV/PS/Fe²⁺ for removal of benzophenone-4 (BZ4), nitrobenzene (NB), nitrobenzoic acid (NBA), atrazine (ATZ) and ampicilline (AMP). Br⁻ demonstrated to be a strong inhibitor in the removal of all the considered contaminants except for NB when, the removal was instead enhanced in bromide containing water.

Contaminants of Emerging Concern in Water and Wastewater: Advanced Treatment Processes presents the state-of-the-art in the design and use of adsorbents, membranes, and UV/oxidation processes, along with the challenges that will need to be addressed to close the gap

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between development and implementation in water/wastewater treatment applications. Chapters cover adsorbent and membrane design and performance, direct comparison of performance data between new (inorganic and metal organic nanoporous materials) and classic adsorbents and membranes, a list of advantages, disadvantages, and challenges related to performance limitations, regenerability, and upscaling. In addition, users will find sections on the identification of potential site and off-site applications that are listed according to adsorbent and membrane types, transformation of CECs in low- and/or medium-pressure UV irradiation processes used for disinfection, the oxidation of CECs by chlorine and ozone, and a comparison of advanced oxidation processes for the treatment of a variety of CECs in water and wastewater. Addresses the advantages/disadvantages of select technologies, including energy resource needs and waste management issues of reverse osmosis, amongst other issues Presents information on the advancements of technology within the realm of Engineered Treatments of CECs Focuses on the inherent science and technology of advanced treatment processes Over the past few decades the boom in the industrial sector has contributed to the release in the environment of pollutants that have no regulatory status and which may have significant impact on the health of animals and humans. These pollutants also refer as “emerging pollutants” are mostly aromatic compounds which derive from excretion of pharmaceutical, industrial effluents and municipal discharge. Some form of pollutions have also evolved, including the proliferation of acid mine drainage from oxidation or weathering of obsolete and unmanaged excavations around the world; this results mostly in the dispersion of inorganic pollutants in the environment at level surpassing the treatment capacity of conventional techniques. It is recurrent

these days to find water treatment plants which no longer produce water that fits the purpose of domestic consumption based on newly established guidelines. This situation has prompted water authorities and researchers to develop tools for proper prediction and control of the dispersion of pollutants in the environment to ensure that appropriate measures are taken to prevent the occurrence of outbreaks due to sudden load of these pollutants in the water system. The chapters in this book cover a wide range of nano and bio-based techniques that have been designed for the real time detection of emerging contaminants in environmental water sources, geochemical models that are continuously improved for the prediction of inorganic contaminants migration from the mine solid wastes into ground and surface waters. Remediation strategies are also discussed and include effective techniques based on nanotechnology, advanced membrane filtration, oxidative and bio- degradation processes using various types of nanocatalysts, biocatalysts or supporting polymer matrices which are under advanced investigations for their implementation at large scale for the removal of recalcitrant pollutants from polluted water. This book is divided in two sections, the first section covers the occurrence of emerging pollutants in environmental water while the second section covers state of the art research on the removal of emerging pollutants from water using sustainable technologies. A total of 13 chapters addressing various topics related to the two sections are essentially based on recent development in the respective field which could have a significant impact on the enhancement of the performance of wastewater treatment plants around the world and especially in developing countries where access to clean and safe water remains a daily challenge

Visible Light Active Structured Photocatalysts for the Removal of Emerging Contaminants: Science and Engineering

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addresses the potential role of visible active photocatalytic processes for the removal of emerging contaminants. The book discusses the classification, sources and potential risks of emerging pollutants in water as well as the different synthesis methods of visible active structured photocatalysts with relation to their applications in photocatalytic processes for the removal of organic and inorganic emerging contaminants. Finally, the possible reaction pathways occurring during the visible or solar photocatalytic processes together with toxicity assessment are discussed. The book is a useful guide for academics, researchers and technicians in chemical engineering, chemistry and environmental sciences. Defines emerging contaminants and what can be included in that group of contaminants commonly named "contaminants of emerging concern" Presents different synthesis methods of visible active structured photocatalysts and their applications in solar or visible light photocatalytic systems for the removal of organic and inorganic emerging contaminants Analyzes reaction pathways that occur during the visible or solar photocatalytic processes, also including toxicity assessments Phenolic compounds as a large class of metabolites found in plants have attracted attention since long time ago due to their properties and the hope that they will show beneficial health effects when taken as dietary supplements. This book presents the state of the art of some of the natural sources of phenolic compounds, for example, medicinal plants, grapes or blue maize, as well as the modern methods of extraction, quantification, and identification, and there is a special section discussing the treatment, removal, and degradation of phenols, an important issue in those phenols derived from the pharmaceutical or petrochemical industries.

This book presents the state-of-the-art in the area of water remediation. It covers topics such as decentralized ecological wastewater treatment, applications of remote sensing and

geographic information systems (GIS) in water quality monitoring and remediation, water remediation through nanotechnology, and processes used in water purification. The contents of this volume will prove useful to researchers, students, and policy makers alike.

Emerging contaminants are chemical and biological agents for which there is growing concern about their potential health and environmental effects. The threat lies in the fact that the sources, fate and toxicology of most of these compounds have not yet been studied. Emerging contaminants, therefore, include a large number of both recently discovered and well-known compounds such as rare earth elements, viruses, bacteria, nanomaterials, microplastics, pharmaceuticals, endocrine disruptors, hormones, personal care products, cosmetics, pesticides, surfactants and industrial chemicals. Emerging contaminants have been found in many daily products, and some of them accumulate in the food chain. Correlations have been observed between aquatic pollution by emerging contaminants and discharges from wastewater treatment plants. Most actual remediation methods are not effective at removing emerging contaminants. This first volume presents comprehensive knowledge on emerging contaminants with a focus on analysis, toxicity, antibiotic resistance and human health.

Rapid industrialization is a serious concern in the context of a healthy environment. With the growth in the number of industries, the waste generated is also growing exponentially. The various chemical processes operating in the manufacturing industry generate a large number of by-products, which are largely harmful and toxic pollutants and are generally discharged into the natural water bodies. Once the

pollutants enter the environment, they are taken up by different life forms, and because of bio-magnification, they affect the entire food chain and have severe adverse effects on all life forms, including on human health. Although, various physico-chemical and biological approaches are available for the removal of toxic pollutants, unfortunately these are often ineffective and traditional clean up practices are inefficient. Biological approaches utilizing microorganisms (bacterial/fungi/algae), green plants or their enzymes to degrade or detoxify environmental pollutants such as endocrine disruptors, toxic metals, pesticides, dyes, petroleum hydrocarbons and phenolic compounds, offer eco- friendly approaches. Such eco-friendly approaches are often more effective than traditional practices, and are safe for both industry workers as well as environment. This book provides a comprehensive overview of various toxic environmental pollutants from a variety natural and anthropogenic sources, their toxicological effects on the environment, humans, animals and plants as well as their biodegradation and bioremediation using emerging and eco-friendly approaches (e.g. Anammox technology, advanced oxidation processes, membrane bioreactors, membrane processes, GMOs), microbial degradation (e.g. bacteria, fungi, algae), phytoremediation, biotechnology and nanobiotechnology. Offering

fundamental and advanced information on environmental problems, challenges and bioremediation approaches used for the remediation of contaminated sites, it is a valuable resource for students, scientists and researchers engaged in microbiology, biotechnology and environmental sciences.

Emerging and Nanomaterial Contaminants in Wastewater: Advanced Treatment Technologies describes the state-of-the-art of remediation technologies, such as those involving nanotechnology, filtration devices (e.g. membranes), strategies involving adsorption and precipitation processes, development of new sorbents, nanosorbents, biosorbents, green technology, bio-electrokinetics, degradation of pollutants, advanced oxidative process, oxidative electrochemical and photocatalytic processes, catalytic degradation, and emerging hybrid technologies, such as photocatalyst membrane photoreactors using TiO_2 . Scientists and researchers in academia and industry will benefit from this comprehensive resource on the fundamental science behind the mechanisms at which wastewater sources can be purified from emerging contaminants. Provides a fundamental understanding of emerging contaminants to help readers select appropriate remediation technologies. Discusses, in detail, new and advanced green technologies that remove emerging contaminants

from wastewater Shows how to ensure water quality and save public health by protecting water resources from contaminants

Pharmaceuticals and Personal Care Products Waste Management and Treatment Technology: Emerging Contaminants and Micro Pollutants provides the tools and techniques for identifying these contaminants and applying the most effective technology for their remediation, recovery and treatment. The consumption of pharmaceuticals and personal care products (PPCPs) has grown significantly over the last 35 years, thus increasing their potential risk to the environment. As PPCPs are very difficult to detect and remove using conventional wastewater treatment methods, this book provides solutions to a growing problem.

Includes sampling, analytical and characterization methods and technology for detecting PPCPs in the environment Provides advanced treatment and disposal technologies for the removal of PPCPs from wastewater, surface water, landfills and septic systems Examines the pathways of PPCPs into the environment

This book focuses on innovative treatment technologies for the elimination of emerging contaminants in wastewater and drinking water treatment processes. The book also discusses sources and occurrence of emerging contaminants in municipal and industrial waste, giving an overview

of state-of-the-art analytical methods for their identification. Further important aspects covered include the acute and chronic effects and overall impact of emerging contaminants on the environment.

This book describes how psychiatric pharmaceuticals, namely antidepressants, anxiolytics, sedatives and hypnotics are among the most prescribed active substances due to the higher occurrence of psychiatric disorders throughout the world. It goes on to demonstrate how patients' excretion of the active compounds along with several metabolites is considered to be the main pathway for the occurrence of these emerging pollutants in wastewater treatment plant effluents, surface and drinking water, soils and sediments. Further chapters are devoted to an exploration of these pharmaceuticals' high persistence, toxicity and intrinsic biological activity, which can affect the nervous and endocrine systems of terrestrial and aquatic non-target organisms, the dissemination of these compounds in environment matrices and the growing number of associated problems and concerns. The remainder of the book describes how conventional wastewater treatment processes are generally inefficient when it comes to the removal of this type of pollutants, giving rise to the demand for implementing alternative or complementary treatment technologies. Extensive research studies

on the efficiency of the degradation and/or removal of these pollutants are summarized, and adsorption, membrane and advanced oxidation processes (AOP) are proposed. Given its content and structure, the book offers a concise summary of the most significant findings on psychiatric pharmaceutical removal in wastewater.

In the last years the release of emerging pollutants such as Endocrine Disruptors (EDCs), Pharmaceuticals and Personal Care Products (PPCPs) into the environment has raised great concern. While investigating how to treat emerging pollutants from water and wastewater, researchers have drawn attention on the implementation of more environmentally friendly technologies able to achieve high removal efficiency at low costs. Emerging Compounds Removal from Wastewater by Green Technologies: Natural and Solar Based Treatments introduces green chemistry in relation to these treatment technologies. More specifically, this volume:

- Reviews the suitability of alternative adsorption processes that use natural adsorbents natural materials or agricultural waste in light of the inefficiency of conventional wastewater treatment plants;
- Evaluates the potential of constructed wetlands for the removal of some categories of trace contaminant of worldwide relevance in view of their application as decentralized systems;
- Highlights the promising role of a special class of oxidation

techniques defined as Advanced Oxidation Processes (AOPs) supported by sunlight. This volume will be of great interest to students, technicians, and academics alike who are interested in evaluating and selecting the technologies that lead to better and more sustainable treatment of this huge class of pollutants.

This book reviews water treatment technologies for the removal of pharmaceutically active compounds (PhACs). It provides the reader with an overview of state-of-the-art techniques and recent efforts to develop more sustainable approaches. After nearly two decades of research into the presence and impact of PhACs in the environment, they remain one of the hottest topics in the fields of environmental chemistry, toxicology and engineering. Accordingly, intensive research efforts are currently being devoted to water treatment technologies that can reduce the presence of these emerging contaminants in water bodies. This book examines various types of contaminated water from industry, hospitals and urban wastewater. It provides the reader with a range of potential solutions for water treatment and reuse, and addresses the advancement of analytical tools for evaluating the performance and efficiency of treatment technologies.

Emerging Contaminants presents the reader with information on classification, recent studies, and

adverse effects on the environment and human health of the main classes of contaminants.

Emerging contaminants are synthetic or natural compounds and microorganisms produced and used by humans that cause adverse ecological and human health effects when they reach the environment. This book is organized into four sections that cover the classification of contaminants and the instrumental techniques used to quantify them, recent studies on pesticides, antibiotics as an important group of emerging contaminants, and studies of different classes of emerging contaminants such as polybrominated diphenyl ethers (PBDEs), microplastics, and others.

With an increasing population, use of new and diverse chemicals that can enter the water supply, and emergence of new microbial pathogens, the U.S. federal government is faced with a regulatory dilemma: Where should it focus its attention and limited resources to ensure safe drinking water supplies for the future? *Identifying Future Drinking Water Contaminants* is based on a 1998 workshop on emerging drinking water contaminants. It includes a dozen papers that were presented on new and emerging microbiological and chemical drinking water contaminants, associated analytical and water treatment methods for their detection and removal, and existing and proposed environmental databases to assist in their proactive identification and regulation. The papers are preceded by a conceptual approach and related recommendations to EPA for the periodic creation of future Drinking Water Contaminant Candidate Lists (CCLs--produced every five years--include currently

unregulated chemical and microbiological substances that are known or anticipated to occur in public water systems and that may pose health risks).

This book discusses contamination of water, air, and soil media. The book covers health effects of such contamination and discusses remedial measures to improve the situation. Contributions by experts provide a comprehensive discussion on the latest developments in the detection and analysis of contaminants, enabling researchers to understand the evolution of these pollutants in real time and develop more accurate source apportionment of these pollutants. The contents of this book will be of interest to researchers, professionals, and policy makers alike.

Biological treatment of wastewater is a low-cost solution for remediation of wastewater. This book focuses on the bioremediation of wastewater, its management, monitoring, role of biofilms on wastewater treatment and energy recovery. It emphasizes on organic, inorganic and micropollutants entering into the environment after conventional wastewater treatment facilities of industrial, agricultural and domestic wastewaters. The occurrence of persistent pollutants poses deleterious effects on human and environmental health. Simple solution for recovery of energy as well as water during biological treatment of wastewater is a viable option. This book provides necessary knowledge and experimental studies on emerging bioremediation processes for reducing water, air and soil pollution.

Endocrine Disrupting Chemicals (EDCs) have been shown to produce changes in the endocrine system of organisms that lead to increases in cancers and abnormalities in reproductive structure and function. Recent research has highlighted the existence of hormonally active compounds in sewage and industrial effluents and their potential for recycling back into the environment - including drinking water supplies- through

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point sources and non-point sources. Endocrine Disrupters in Wastewater and Sludge Treatment Processes presents the latest research on EDCs, covering the sources, fate, and transport of EDCs in sewage and industrial effluents, and sludge treatment and disposal options in light of effects on receiving environments. In addition, the authors review current legislation, future research needs, and potential management strategies for endocrine disrupters in the environment.

Pharmaceuticals in the Environment: current knowle

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