



# Nanocomposites In Wastewater Treatment

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## **Nanocomposites In Wastewater Treatment:**

**Nanocomposites in Wastewater Treatment** Ajay Kumar Mishra, 2014-12-04 Nanocomposites have better adsorption capacity selectivity and stability than nanoparticles Therefore they find diversified applications in many areas Recently various methods for heavy metal detection from water have been extensively studied The adsorption of various pollutants such as heavy metal ions and dyes from the contaminated water with the help of nanocomposites has attracted significant attention This book presents a comprehensive discussion on wastewater research It covers a vast background of the recent literature It describes the applications of nanocomposites in various areas including environmental science Particularly it is highly useful to researchers involved in the environmental and water research on nanocomposites and their applications The book covers a broad research area of chemistry physics materials science polymer science and engineering and nanotechnology to present an interdisciplinary approach and also throws light on the recent advances in the field

**Functional Polymer Nanocomposites for Wastewater Treatment** Mpitloane Joseph Hato, Suprakas Sinha Ray, 2022-03-01 This book provides an overview of the latest advances in applications of nanocomposites in wastewater treatment This book is dedicated to recent developments in the application of polymer nanocomposites to wastewater treatment Based on their morphology and tailored compositions polymer nanocomposites provide powerful tools for environmental remediation via selective adsorption of contaminants in complex environmental matrices The book reviews recent progress in this field covering various nanocomposite fabrication routes and novel applications for pollutant sensing and detection It includes discussion of different types of nanocomposites based on metal organic frameworks and hydrogels while also covering related topics such as nanocomposite membranes photocatalysts and bio nanocomposites for pollution abatement Ideal for researchers and engineers in the field this collection of contributed chapters offers a timely review of current research in nanomaterials for cost effective pollution control technologies [Handbook of Nanomaterials for Wastewater Treatment](#) Bharat A. Bhanvase, Shirish Sonawane, Vijay B. Pawade, Aniruddha B. Pandit, 2021-05-05 Handbook of Nanomaterials for Wastewater Treatment Fundamentals and Scale up Issues provides coverage of the nanomaterials used for wastewater treatment covering photocatalytic nanocomposite materials nanomaterials used as adsorbents water remediation processes and their current status and challenges The book explores the major applications of nanomaterials for effective catalysis and adsorption also providing in depth information on the properties and application of new advanced nanomaterials for wastewater treatment processes This is an important reference source for researchers who need to solve basic and advanced problems relating to the use of nanomaterials for the development of wastewater treatment processes and technologies As nanotechnology has the potential to substantially improve current water and wastewater treatment processes the synthesis methods and physiochemical properties of nanomaterials and noble metal nanoparticles make their performance and mechanisms efficient for the treatment of various pollutants Explains the properties of the most commonly

used nanomaterials used for wastewater treatment Describes the major nanoscale synthesis and processing techniques for wastewater treatment Assesses the major challenges for using nanomaterials on a mass scale for wastewater treatment

Innovative Nanocomposites for the Remediation and Decontamination of Wastewater Kumar, Azad, 2022-05-27 Industry wastewater is a major contributor to environmental pollution with chemicals such as dyes acids fungicides and more creating a threat to the environment Nanocomposites of heterogeneous photocatalysis can be used to cure such problems due to its efficiency and ease of use as well as the fact that it turns toxic chemicals completely to carbon dioxide and inorganic acids With toxic chemicals posing a tremendous threat to ecological wellbeing and human health it is integral that a variety of nanocomposites are studied for their use in the degradation of toxic and hazardous chemicals Innovative Nanocomposites for the Remediation and Decontamination of Wastewater describes the synthesis of nanomaterials and its application for the protection of the environment It presents studies on the photodegradation of the various toxic and hazardous chemicals by different nanocomposites as well as the decontamination of bodies of water through the use of various nanocomposites Covering topics such as dye degradation novel biomaterials and structural modification this premier reference source is a vital resource for environmental scientists construction managers compliance officers biochemists biophysicists conservation scientists hydrologists microbiologists libraries students and educators of higher education researchers and academicians

*Development in Wastewater Treatment Research and Processes* Maulin P. Shah, Susana Rodriguez-Couto, 2024-01-20 Advanced Oxidation Processes for Tannery Effluent provides a detailed overview of currently applied and tested sewage treatment technologies and the integration of advanced processes to remove trace organic contaminants and micro organisms The book discusses the potential of improved biological treatment to produce reusable wastewater new municipal wastewater disinfection processes and the reduction of bacteria resistant to antibiotics as well as the effects of advanced oxidation processes on microbial and chemical contaminants Advanced Oxidation Processes for Tannery Effluent features membrane bioreactors moving bed bioreactors light and solar technology ozonation and immobilized heterogeneous photocatalysis and provides an assessment of the potential of built wetlands integrated with advanced oxidation technologies to ensure wastewater recycling for reuse The book discusses issues and standards for water reuse the state of application of membrane bioreactors and the treatment of reverse osmosis concentrate for better water use in wastewater treatment It presents the latest developments in the field of drinking water reuse and addresses various important issues in this context such as proper public health protection reliability and monitoring Includes advanced oxidation processes for wastewater treatment Describes various methodologies to treat tannery effluent Outlines applications of different types of treatment strategies to cope up with tannery effluent Applies tertiary advanced oxidation process to remove toxic contaminants from wastewater Provides biochemical pathways of degraded contaminants through various oxidation processes

Nano-solutions for Sustainable Water and Wastewater Management Manoj Chandra Garg, Vishnu D. Rajput, Tatiana

Minkina, Sushil Kumar Himanshu, 2025-06-11 The proposed book aims to provide a comprehensive overview of the advancements and potential applications of nanotechnology in addressing the challenges of water and wastewater management. The book intends to explore the latest research findings, innovative technologies, and emerging trends in utilizing nanomaterials for sustainable and efficient water treatment processes. The primary purpose of this new book is to bridge the gap between nanotechnology and water/wastewater management by presenting cutting-edge research and practical applications. The main objective of this new book is to serve as a valuable resource for researchers, engineers, policymakers, and professionals working in the field of water and wastewater treatment. The wide range of topics, including nanomaterial synthesis, characterization techniques, various nanotechnology-based treatment processes, nanomaterials for contaminant removal, nanosensors for water quality monitoring, and nanotechnology-enabled resource recovery, will be covered in this book. As the authors of this book, our motivation stems from the urgent need to address global water scarcity and pollution issues. The nanotechnology holds immense potential in revolutionizing water and wastewater management practices by offering highly efficient, cost-effective, and sustainable solutions. By compiling and presenting the latest research and advancements in this field, we aim to inspire further research, collaboration, and innovation in utilizing nanotechnology for the betterment of water resources and environmental sustainability. The main goal of this new book is to contribute to the dissemination of knowledge and promote the adoption of nanotechnology in achieving sustainable water and wastewater management worldwide.

#### **Advances in Nanocomposite Materials for Environmental and Energy Harvesting Applications**

Ahmed Esmail Shalan, Abdel Salam Hamdy Makhlouf, Senentxu Lanceros-Méndez, 2022-03-03 This book discusses the fundamental synthesis, properties, physico-chemical characterizations, and applications of recently explored nanocomposite materials. It covers the applications of these different nanocomposite materials in the environmental and energy harvesting fields. The chapters explore the different techniques used for preparation and characterization of several types of nanocomposite materials for applications related to environmental and energy pathways. This book presents a panorama of current research in the field of nanocomposite structures for different applications. It also assesses the advantages and disadvantages of using different types of nanocomposites in the design of different material products. The comprehensive chapters explain the interactions between nanocomposite materials and mechanisms related to applications in environmental pollution and energy shortage.

*Nanocomposites*, 2024-09-25 This book discusses the development, characterization, and applications of nanocomposites, which are advanced materials obtained through the combination of two or more constituents, with one being a continuous phase matrix and the other being a discontinuous or dispersed nanophase. Nanocomposites have gained significant attention due to their excellent properties and multiple applications resulting from synergistic effects between the matrix and reinforced nanophase. Nanocomposites offer advantages over individual nanoparticles in tailoring properties, enhancing stability, and optimizing performance for specific applications. This book

emphasizes the vast potential of nanocomposites in various areas including water treatment food packaging automotive compounds biomedical devices coatings sensors pharmaceuticals and fuel cells among others The properties of nanocomposites are highly dependent on their structure and dimensions and further research is needed to better understand the structure property relationship in these systems The book includes sixteen chapters organized into four sections Carbon Based Nanocomposites Inorganic Nanoparticles Based Nanocomposites Nanocomposites for Environmental Applications and Nanocomposites for Biomedical Applications **Nanocomposites for Pollution Control** Chaudhery Mustansar Hussain,Ajay Kumar Mishra,2018-04-24 Nanocomposites present outstanding mechanical properties and compatibility owing to their composite matrix and unique physical and chemical composition provided by large surface area to volume ratios and high interfacial reactivity Freedom to functionalize nanocomposites with various chemical groups increases their affinity toward target pollutants which is highly desirable for the selective extraction of target analytes in complex environmental matrixes This book presents the recent progress in the field of nanocomposites and their properties fabrication methods and applications for pollution control and sensing It discusses the advances in pollution control techniques made possible because of nanocomposites and focuses on environment friendly and efficient approaches The text also covers economic toxicological and regulatory issues and research trends **Nanocomposites-Advanced Materials for Energy and Environmental Aspects** Mohammad Ehtisham Khan,Jeenat Aslam,Chandrabhan Verma,2023-01-25 Nanocomposites Advanced Materials for Energy and Environmental Aspects provides a brief introduction to metal oxides The book then discusses novel fabrication methodologies and eco friendly methods for using a broad range of metal oxide based nanocomposites in innovative ways Key aspects include fundamental characteristics of environmentally sustainable fabrication of materials for solar power power generation and the textiles industries Commercialization and economic aspects that are currently of major significance are also discussed in detail The book represents an important information resource for material scientists and engineers to create the next generation of products and devices for energy and environmental applications Metal and metal oxide based nanocomposites are at the heart of some of the most exciting developments in the field of energy and environmental research They have exceptional properties and are utilized in electronic and environmental sensing devices for energy storage electrode materials fuel cells membranes and more Covers fabrication standard characterization and photocatalytic mechanism for a wide range of applications Includes broad ranging metal and metal oxide based applications covering environmental energy electronics oil gas water treatment and sensing Evaluates dye consumption in the textiles industries and the energy related research that will determine options for sustainable and transformational opportunities **Sodium Alginate-Based Nanomaterials for Wastewater Treatment** Awais Ahmad,Ikram Ahmad,Tahseen Kamal,Abdullah M. Asiri,Sobia Tabassum,2022-10-11 Sodium Alginate based Nanomaterials for Wastewater Treatment offers detailed coverage of fundamentals and recent advances in sodium alginate based nanomaterials for wastewater treatment The book provides a

detailed overview of the development and application of nanomaterials based sodium alginate so that new methods can be put in place for efficient wastewater treatment This includes illustrating how nanomaterials have enabled the formation of nanocomposites or blends of sodium alginate with other compounds like chitosan for the effective removal of heavy metals from wastewater This important reference source for materials scientists and environmental engineers comprehensively covers nanotechnology applications in efficient wastewater treatment solutions Shows how sodium alginate is being used for the removal of organic and inorganic pollutants from wastewater Explains the formation and application of sodium alginate based beads electro spun fibers nanofibers blends and zerovalent sodium alginate Discusses the future potential of nanomaterial based sodium alginate and its blends

**Bio Refinery of Wastewater Treatment** Maulin P. Shah,Angana Sarkar,2024-09-26 Bio Refinery of Wastewater Treatment Way to Generate Waste to Value focuses on the exploitation of various wastewater treatment technologies and microbial chemical and physical processes as tools for simultaneous value generation during treatment degradation detoxification and stabilization of toxic and hazardous contaminants and restoring contaminated sites The book provides recent advancements in integrative and cost effective wastewater treatment strategies and stipulates all pros and cons of each strategy Bio Refinery of Wastewater Treatment Way to Generate Waste to Value is valuable to researchers and scientists who are working in the field of effluent treatment plants biodegradation of environmental contaminants for environmental protection and sustainable development Provides natural and eco friendly solutions to deal with the problem of pollution aiming value generation Details underlying mechanisms of biorefinery approach associated microbes for simultaneous value generation and removal of emerging contaminants Illustrates numerous successful field studies on the application of bio refinery approach for eco restoration of contaminated sites Presents recent advances and challenges in biorefinery research and applications for sustainable development

*Modern Age Waste Water Problems* Mohammad Oves,Mohammad Omaish Ansari,Mohammad Zain Khan,Mohammad Shahadat,Iqbal M.I. Ismail,2019-06-12 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

*Adsorption through Advanced Nanoscale Materials* Chandrabhan Verma,Jeenat Aslam,Mohammad Ehtisham Khan,2023-08-22 Adsorption through Advanced Nanoscale Materials Applications in Environmental Remediation brings together the latest developments in the utilization of advanced nanoadsorbents in wastewater treatment pollution control removal and remediation gas separation and other environmental applications The book begins by providing an overview of absorption adsorbents and nanoadsorbents introducing properties

classification synthesis characterization enhancement of adsorption capabilities principles and advantages and disadvantages of nanoadsorbents Other sections cover the preparation of advanced nanoadsorbents based on specific materials for wastewater treatment including adsorbents incorporating carbon nanotubes graphene and graphene oxide carbon dots and fullerene polymer nanocomposites metal oxides nanoclay nanofillers and filtration membranes Final sections examine the role of nanoadsorbents in broader environmental applications including areas such as pollution control and removal and gas separation Finally other important considerations are studied including toxicity and health impact ecotoxicological effects commercialization and economic issues challenges and research gaps trends and future opportunities Provides in depth coverage of nanoadsorbents for a range of targeted environmental applications Covers in detail fundamentals such as synthesis methods characterization and inhibition mechanisms Addresses key areas such as toxicity health impact research gaps trends and commercialization Inorganic-Organic Composites for Water and Wastewater Treatment Eric

Lichtfouse, Subramanian Senthilkannan Muthu, Ali Khadir, 2021-12-03 This second volume on Inorganic Organic Composites for Water and Wastewater Treatment reviews research findings on advanced materials and methods for purification Considering the fact that new emerging pollutants are released into the environment and water bodies it is necessary to develop more advanced techniques in order to treat them The utilization of metal organic framework in view of applications synthesis properties like adsorption characterization of the electronic and geometric aspects and hybrid systems is reviewed in this book and the advantages disadvantages shortcomings including future prospects associated with metal based nanoparticles and nanocomposites for water decontamination are discussed In addition the use of carbon quantum dots supramolecular ion exchange resins multifunctional composite aerogels algal biomass valorization and titania containing composites in treatment processes are also presented **Smart Nanomaterials for Environmental Applications** Olusola

Olaitan Ayeleru, Azeez Olayiwola Idris, Sadanand Pandey, Peter Apata Olubambi, 2024-08-26 Smart nanomaterials are making their presence ever so noticeable in areas like environmental protection and remediation as well as in many other fields of study The international team of expert researchers behind Smart Nanomaterials for Environmental Applications aims to spotlight the latest rapid developments in the design and manipulation of materials at the nanoscale and to concisely present information regarding their novel methods of utilization for the safeguard of the environment while at the same time apprising readers of challenges encountered and anticipated prospects The volume illustrates state of the art actionable content which is relevant and extremely valuable for those who want to apply this up to date knowledge in industry too Offers fundamentals of smart nanomaterials including characterization design and fabrication methods Includes advanced information on fine tuning different morphologies of smart nanomaterials Features three case studies on real life applications of smart nanomaterials **Emerging Carbon-Based Nanocomposites for Environmental Applications** Ajay Kumar

Mishra, Chaudhery Mustansar Hussain, Shivani Bhardwaj Mishra, 2020-09-10 The book is a comprehensive deep dive into the



developments and advancements of emerging carbon based nanocomposites for wastewater applications Science and technology development are tackling one of the world's most pressing concerns water contamination and effective treatment Carbon based nanocomposites have emerged as one of the leading materials in this treatment push because of their properties and high ability for the catalytic degradation of contaminants from aqueous segments The 10 chapters in this timely book cover the follows areas Carbon based nanocomposites for remediation of heavy metals and organic pollutants from wastewater Functional green carbon nanocomposites for heavy metal treatment in water Green nanocomposites and applications in environmentally friendly carbon nanomaterials Carbon based nanocomposites as heterogeneous catalysts for organic reactions in environment friendly solvents Carbon based polymer nanocomposite applications Biochar based adsorbents for the removal of organic pollutants from aqueous systems Carbon nanomaterial based green nanocomposites The removal of trihalomethanes from water using nanofiltration membranes Nanocomposite materials as electrode materials in microbial fuel cells for the removal of water pollutants Plasmonic smart nanosensors for the determination of environmental pollutants

**Sustainable Polymer Composites and Nanocomposites** Inamuddin, Sabu Thomas, Raghvendra Kumar Mishra, Abdullah M. Asiri, 2019-02-01 This book presents emerging economical and environmentally friendly polymer composites that are free of the side effects observed in traditional composites It focuses on eco friendly composite materials using granulated cork a by product of the cork industry cellulose pulp from the recycling of paper residues hemp fibers and a range of other environmentally friendly materials procured from various sources The book presents the manufacturing methods properties and characterization techniques of these eco friendly composites The respective chapters address classical and recent aspects of eco friendly polymer composites and their chemistry along with practical applications in the biomedical pharmaceutical automotive and other sectors Topics addressed include the fundamentals processing properties practicality drawbacks and advantages of eco friendly polymer composites Featuring contributions by experts in the field with a variety of backgrounds and specialties the book will appeal to researchers and students in the fields of materials science and environmental science Moreover it fills the gap between research work in the laboratory and practical applications in related industries

**Polymer Nanocomposite Membranes in Water Treatment and Desalination** Md Rezaur Rahman, Muhammad Khusairy Bin Bakri, 2025-06-15 Over the past few years significant research has been conducted into the development of polymeric nanocomposite membranes to increase environmental sustainability and to demonstrate their benefits for commercial water treatment and desalination applications Polymer Nanocomposite Membranes for Water Treatment and Desalination Recent Developments Future Opportunities and Sustainable Applications presents the latest research findings in this important field The book summarizes current advances in the production characterization and applications of these membranes for water treatment and desalination Bio composite alterations functional group additions and nanomaterial assemblies are also examined in depth The current breakthroughs in

reverse osmosis oil removal heavy metals removal dye removal photocatalytic degradation of organic contaminants and pesticide removal from wastewater are also discussed Additionally the book also highlights bacteria removal by polymeric nanocomposite membranes as well as the major benefits and drawbacks of various adsorbent materials Special emphasis is also placed on the adsorption mechanism which includes chemisorption and physisorption The book will be a valuable reference source for academic and industrial researchers as well as early career researchers who are working in the research and development of polymer nanocomposite membranes for water treatment and desalination Covers production characterization and applications of polymeric membranes for water treatment and desalination Discusses fundamentals materials and methods chemistry synthesis procedures and membrane preparation methods Methods of scaling up production from lab to industry are also covered in detail Focus on sustainability

*Aquananotechnology* Kamel A Abd-Elsalam, Muhammad Zahid, 2020-12-01

*Aquananotechnology Applications of Nanomaterials for Water Purification* focuses on the impacts of and opportunities for the application of nanotechnology to enhance water quality and the societal concerns surrounding the widespread use of nanotechnology in the water arena Sections cover the use of nano sensors for the detection of water pollutants the control of waterborne pathogens and the use of nano biochar coal fly composites for phytoremediations wastewater pollutants In addition the book explores the uses of nano adsorbents for heavy metals dyes Arsenic pesticides and water wastewater remediation and decontamination of water from xenobiotics bionanocomposites metal oxides silver zinc nanoparticles and carbon based nanomaterials for wastewater treatment In addition the book covers the use of zerovalent iron nanomaterials and nanostructured mesoporous silica for water purification along with nano hydrogels to increase water efficiency and conservation Finally the socioeconomic impacts and risks of aquananotechnology in ecosystems are discussed This book provides a detailed description of the ecological applications of nanomaterials in aquatic environments offering a cogent analysis of both major applications and challenges Shows how a range of nanomaterial types are being used for ecological applications in aquatic environments Explores the effects different types of nanomaterials have on a variety of ecosystems Assesses the major challenges of using nanotechnology to improve water quality on a mass scale

## The Enigmatic Realm of **Nanocomposites In Wastewater Treatment**: Unleashing the Language is Inner Magic

In a fast-paced digital era where connections and knowledge intertwine, the enigmatic realm of language reveals its inherent magic. Its capacity to stir emotions, ignite contemplation, and catalyze profound transformations is nothing lacking extraordinary. Within the captivating pages of **Nanocomposites In Wastewater Treatment** a literary masterpiece penned with a renowned author, readers embark on a transformative journey, unlocking the secrets and untapped potential embedded within each word. In this evaluation, we shall explore the book's core themes, assess its distinct writing style, and delve into its lasting impact on the hearts and minds of those that partake in its reading experience.

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## Nanocomposites In Wastewater Treatment Introduction

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