

# Pollution

## Air

$\text{NH}_3$ ,  $\text{CO}$ ,  $\text{CO}_2$ ,  
 $\text{NO}_x$ ,  $\text{CH}_4$ ,  $\text{SO}_2$ ,  $\text{H}_2\text{S}$ ,  
VOCs, carboxylic acids,  
and aldehydes



Heavy metals  
chlorinated compounds,  
food waste,  
and oil

## Soil

Bacteria, virus,  
heavy metals,  
petroleum hydrocarbons,  
oil, pesticides,  
dye, and solvents

## Water

# Nanoremediation

Fullerenes  
graphene,  
carbon nanotubes  
(SWNT, MWNT), and  
activated carbon

Silica based  
materials,  
alkaline ceramics,  
and  
apatite

Graphene,  
graphite oxide, and  
carbon nanotubes  
(SWNT, MWNT)

Nanoscale  
zero-valent iron.  
Supports such as  
activated carbon,  
zeolites, polymers and  
 $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{TiO}_2$   
nanoparticles

Metallic,  
bimetallic and  
metal oxides  
nanoparticles:  
Fe, Ag, Au

Activated carbon  
and  
carbon nanotubes  
(SWNT, MWNT)

Polymer  
nanoparticles,  
nanocomposites  
and  
nanofiltration  
membranes

# Nanotechnology For Environmental Remediation

**Giusy Lofrano, Giovanni  
Libralato, Jeanette Brown**



## **Nanotechnology For Environmental Remediation:**

Nanotechnology for Environmental Remediation Sabu Thomas, Merin Sara Thomas, Laly A. Pothan, 2022-08-01

Nanotechnology for Environmental Remediation Comprehensive resource on using nanomaterials to alleviate environmental pollution Contaminated land soil and water pose a threat to the environment and health These sites require immediate action in terms of assessing pollution and new remediation strategies Nanotechnology for Environmental Remediation helps readers understand the potential of nanotechnology in resolving the growing problem of environmental contamination The specific aim of this book is to provide comprehensive information relating to the progress in the development of functional nanomaterials and nanocomposites which are used for the environmental remediation of a variety of contaminants The work deals with the different aspects of nanotechnology in water air and soil contamination and presents the recent advances with a focus on remediation Core topics discussed in the work include Nanotechnology that can be used to engineer and tailor particles for specific environmental remediation applications A big picture conceptual understanding of environmental remediation methods for researchers environmentalists and professionals involved in assessing and developing new nano based strategies A detailed approach towards the different remediation procedures by various nanomaterials such as metal nanoparticles polymeric nanoparticles carbon nanotubes and dendrimers The societal impact that nanotechnology has on the environment Chemists and biotechnologists can use Nanotechnology for Environmental Remediation as a comprehensive reference work for thoroughly understanding this new type of technology and why it is so important when considering environmental remediation efforts Due to the practical application of nanotechnologies environmental organizations and agencies can also both utilize the work to explore new and more effective ways of doing things both now and into the future as nanotechnology becomes more common

*Sustainable Nanotechnology for Environmental Remediation* Rama Rao Karri, Janardhan Reddy Koduru, Nabisab Mujawar Mubarak, Erick R. Bandala, 2022-01-13 Sustainable Nanotechnology for Environmental Remediation provides a single source solution to researchers working in environmental wastewater management biological and composite nanomaterials applications It addresses the potential environmental risks and uncertainties surrounding the use of nanomaterials for environmental remediation giving an understanding of their impact on ecological receptors in addition to their potential benefits Users will find comprehensive information on the application of state of the art processes currently available to synthesize advanced green nanocomposite materials and biogenic nanomaterials Other sections explore a wide range of promising approaches for green nanotechnologies and nanocomposites preparations Case study chapters connect materials engineering and technology to the social context for a sustainable environment Applications and different case studies provide solutions to the challenges faced by industry thus minimizing negative social impacts Provides information on the use of biologically mediated synthetic protocols to generate nanomaterials Discusses a wide range of promising approaches for green nanotechnologies and nanocomposites preparations

Presents novel fabrication techniques for bionanocomposites paving the way for the development of a new generation of advanced materials that can cope with spatiotemporal multi variant environments      **Nanotechnologies for**

**Environmental Remediation** Giusy Lofrano,Giovanni Libralato,Jeanette Brown,2017-03-02 In this book discussing the principles of green chemistry and green engineering an international team of investigators present significant recent developments in applying nanoscience nanoengineering and nanotechnology to the area of environmental remediation The opening chapters introduce candidate nanomaterials properties mechanisms that enable the applications the advantages and limitations compared to existing processes and commercial research requirements It then explores the detection and application of nanomaterials in photocatalytic processes and as adsorbents and also covers the effect of nanoparticles in the activated sludge process Later chapters focus on the effects of nanoparticles on crops the risks associated with the presence of nanoparticles in the environment and lastly the environmental effects of nanoscale zero valent iron nZVI on land remediation This timely multi author contributed volume is aimed at students technicians and academics interested in the role risks and benefits of nanotechnology in modern environmental contexts      *Nanotechnology for Environmental Remediation* Sabu Thomas,Merin Sara Thomas,Laly A. Pothan,2022-08-02 Nanotechnology for Environmental Remediation Comprehensive resource on using nanomaterials to alleviate environmental pollution Contaminated land soil and water pose a threat to the environment and health These sites require immediate action in terms of assessing pollution and new remediation strategies Nanotechnology for Environmental Remediation helps readers understand the potential of nanotechnology in resolving the growing problem of environmental contamination The specific aim of this book is to provide comprehensive information relating to the progress in the development of functional nanomaterials and nanocomposites which are used for the environmental remediation of a variety of contaminants The work deals with the different aspects of nanotechnology in water air and soil contamination and presents the recent advances with a focus on remediation Core topics discussed in the work include Nanotechnology that can be used to engineer and tailor particles for specific environmental remediation applications A big picture conceptual understanding of environmental remediation methods for researchers environmentalists and professionals involved in assessing and developing new nano based strategies A detailed approach towards the different remediation procedures by various nanomaterials such as metal nanoparticles polymeric nanoparticles carbon nanotubes and dendrimers The societal impact that nanotechnology has on the environment Chemists and biotechnologists can use Nanotechnology for Environmental Remediation as a comprehensive reference work for thoroughly understanding this new type of technology and why it is so important when considering environmental remediation efforts Due to the practical application of nanotechnologies environmental organizations and agencies can also both utilize the work to explore new and more effective ways of doing things both now and into the future as nanotechnology becomes more common      **Nanotechnology for Environmental Remediation** Sung Hee Joo, Frank Cheng,2006-06-18 The

book examines the suitability of nanoscale zero valent iron ZVI for degradation of agrochemicals for the purpose of developing a cost effective treatment technology It identifies by products produced from the ZVI mediated degradation process of particular contaminants and clarifies the reaction mechanism by which ZVI degrades a chosen contaminant It also assesses how the ZVI based technology may be applied in complex natural systems the limitations to implementation and possible avenues for further research which might improve the viability of the process Nanotechnology for Environmental Pollution Decontamination Fernanda Maria Policarpo Tonelli,Rouf Ahmad Bhat,Gowhar Hamid Dar,2022-11-30 This new volume presents informative research on the different aspects of employing nanotechnology for environmental pollution decontamination highlighting the main tools methods and approaches for contaminants detection and remediation The book takes a biotechnological point of view that considers the main environmental pollutants the safety and economic aspects of nanoremediation nanosensors and nanobiosensors for the detection of pollutants and strategies to promote nanoremediation and nanobioremediation The chapters offer a comprehensive overview of nanotechnologic strategies as essential tools to restore polluted environments and to make more feasible and harmonic the pathway to sustainable development The volume also discusses the use of sensors to detect pollutants and to monitor the quality of environmental restoration Topics include nanozymes organic and inorganic pollutants threatening human health different types of carbon based and non carbon based nanomaterials in nanosensors and nanobiosensors to detect environmental pollution nanomaterials that specifically deal with water soil or air pollution and assisted nanoremediation promoted by plants nanophytoremediation or microorganisms for example mycorrhizal fungus that promote in situ nano phyto mycorrhizo remediation Also addressed are aspects related to a macroperspective of nanoremediation that highlight the economic aspects related to nanotechnology the safety aspects of the use of nanomaterials and the sustainability aspects related to the use of nanomaterials in strategies of environmental restoration Nanotechnology for Environmental Pollution Decontamination Tools Methods and Approaches for Detection and Remediation offers extensive and comprehensive knowledge on nanotechnology applied to pollution detection and remediation assisted or not by biological strategies **Nanotechnology for Environmental Remediation** N. Pariera,2007

**Nanomaterials in Environmental Remediation** Neha Agarwal,Vijendra Singh Solanki,Neetu Singh,Maulin P. Shah,2025-05-29 Environmental contamination poses a significant threat to ecosystems and human health Nanomaterials with their unique properties and versatility have emerged as promising tools for environmental remediation This book collates recent studies and new developments in effective environmental remediation using nanomaterials for cleaning pollutants in different environmental matrices It explores the role of carbon and composite nanomaterials bio nanomaterials nanosheets and phytonanotechnology It also delves into photocatalytic applications of nanomaterials using 3D printed materials for the remediation of the environment along with a deep analysis of the potential environmental risks challenges and the responsible use of nanomaterials The authors also cover the prospective application and advantages of engineered

nanomaterials emphasizing the continuous growth and potential metamorphic impact of nanotechnology Features Provides a comprehensive review of the rapidly growing field of nanotechnology Includes in depth discussion on the detection of pollutants with the help of nanomaterials Offers critical insight into the synthesis and characterization of nanomaterials Covers a vast array of applications illustrating the wide use of different domains of nanotechnology along with their possible toxicological aspects Presents the future of green nanomaterials as sustainable solutions in environmental remediation This book is a great resource for researchers academicians students and professionals in environmental and sustainable engineering nanotechnology and environmental remediation      Nanomaterials for Soil Remediation Abdeltif Amrane,Dinesh Mohan,Aymen Amine Assadi,Ghulam Yasin,Tuan Anh Nguyen,2020-11-29 Nanomaterials for Soil Remediation provides a comprehensive description on basic knowledge and current research progress in the field of soil treatment using nanomaterials Soil pollution refers to the presence of toxic chemicals in soil Compared with air and water remediations soil remediation is technically more challenging due to its complex composition The synergy between engineering and nanotechnology has resulted in rapid developments in soil remediation Nanomaterials could offer new routes to address challenging and pressing issues facing soil pollution This book aims to explore how nanomaterials are used to cleanse polluted soils organic compounds and heavy metal contaminated soils through various nanomaterials based techniques chemical physical biological techniques and their integrations Highlights how nanotechnology is being used to more accurately measure soil pollution levels Discusses how the properties of nanomaterials are being used to make more efficient soil remediation techniques and products Assesses the practical and regulatory challenges of using different nanomaterial based products for soil repair      **Nanomaterials and Nanocomposites for Environmental Remediation** Swatantra P. Singh,Karthik Rathinam,Tarun Gupta,Avinash Kumar Agarwal,2021-08-10 p This monograph focuses on recent development of nanomaterials and nanocomposites for pollution measurement and their control in water air and soil The contents incorporate carbon based metal based and metal organic framework based nanomaterials and nanocomposites for emerging contaminants pharmaceuticals and personal care products degradation disinfection and other traditional pollutants degradation and removal The book also offers updated literature for researchers and academicians working in the field of environmental remediation by nanomaterials Readers will learn about different metal and non metal based nanoparticles for environmental remediation It will be a useful guide for professionals and post graduate students involved in material science engineering chemical engineering and environmental nanotechnology research      **Advanced Nanostructured Materials for Environmental Remediation** Mu. Naushad,Saravanan Rajendran,Francisco Gracia,2019-03-14 This book provides a wide range exploration on the ongoing research and developmental events in environmental nanotechnology Emerging nanomaterials and its technology have been known to offer unique advantages and are continually showing promising potential attracting continuous global attention This work thus discusses experimental studies of various nanomaterials along

with their design and applications and with specific attention to chemical reactions and their challenges for catalytic systems It will make a noteworthy appeal to scientists and researchers working in the field of nanotechnology for environmental sciences

**Nanotechnology in Environmental Remediation. Applications of Nanomaterials in Water Treatment** Rashmi Jain, 2024-01-09 Academic Paper from the year 2023 in the subject Environmental Sciences grade A course Institute of Sci Tech Affairs language English abstract Though in their nascent phase nanomaterials possess a glimmer of potential for forthcoming endeavours in the realm of water treatment In contemplating the vast expanse of possibilities one cannot help but be captivated by the potential that lies within the utilisation of nanomaterials in the realm of water treatment It is a concept that holds the promise of transforming our very approach to the daunting challenges posed by water pollution and in doing so paving the way towards a future that is not only sustainable but also harmonious with the delicate balance of our planet Through the utilisation of the extraordinary attributes possessed by nanoceramics a realm of possibilities unfolds before us wherein we may cultivate methodologies that are not only more proficient but also more potent in the realm of industrial wastewater treatment thereby safeguarding our precious environment As the relentless march of progress propels research in this domain ever forward a tantalising horizon of possibilities unfurls before us With bated breath we await the advent of even more ingenious and groundbreaking solutions poised to tackle the formidable quandaries posed by water pollution

**Environmental Applications of Microbial Nanotechnology** Pardeep Singh, Vijay Kumar, Mansi Bakshi, Chaudhery Mustansar Hussain, Mika Sillanpää, 2022-10-26 Environmental Applications of Microbial Nanotechnology Emerging Trends in Environmental Remediation discusses emerging trends and recent advancements in environmental remediation The book provides environmental applications of microbial nanotechnology that helps readers understand novel microbial systems and take advantage of recent advances in microbial nanotechnologies It highlights established research and technology on microbial nanotechnology s environmental applications moves to rapidly emerging aspects and then discusses future research directions The book provides researchers in academia and industry with a high tech start up that will revolutionize the modern environmental applications of microbial nanotechnology research Provides the fundamentals of microbial nanotechnology in relation to environmental applications Addresses challenging impacts of microbial nanotechnology on the environment human health safety and sustainability Provides principles and advanced trends and approaches for environmental remediation Features real time applications with case studies that illustrate how microbial nanotechnology influences modern sciences and technology

**Nanoremediation** Fouad Sabry, 2025-03-26 Nanoremediation The introduction to nanoremediation covers its definition significance and how it has become a gamechanger in environmental science The chapter sets the stage for understanding its potential to combat pollution Pollution from nanomaterials This chapter explores the potential environmental risks posed by nanomaterials addressing both their beneficial and harmful aspects and the balance that needs to be achieved for safe application Titanium dioxide

nanoparticle A deep dive into titanium dioxide nanoparticles detailing their role in environmental remediation and their widespread use in cleaning air and water from pollutants Green nanotechnology This chapter highlights the emergence of green nanotechnology and its sustainable approach to addressing environmental concerns through nanoremediation processes that are both effective and ecofriendly Arturo A Keller Focusing on Arturo A Keller's contributions this chapter outlines his groundbreaking research and its impact on advancing nanoremediation strategies in realworld applications Mercury nanotrap water filtration The exploration of mercury nanotrap water filtration technologies and their importance in removing mercury contamination from water bodies a major environmental challenge Groundwater remediation Groundwater contamination is tackled through innovative nanoremediation techniques emphasizing the importance of restoring clean water sources and ensuring sustainable water supply Laurent Charlet A look at Laurent Charlet's influential work particularly in the context of nanotechnology's role in addressing contaminated water and soil through novel remediation methods Environmental remediation An overview of the broader field of environmental remediation showing how nanotechnology fits into current trends and future possibilities for solving global pollution issues Jacqueline Quinn engineer This chapter explores Jacqueline Quinn's engineering approach to nanoremediation providing case studies and examples of her work to demonstrate the application of nanotechnology in realworld environmental issues In situ chemical oxidation A discussion on in situ chemical oxidation explaining its role in treating contaminated environments through nanotechnologyassisted reactions that break down harmful pollutants in place Electrical resistance heating The use of electrical resistance heating as a remediation technique highlighting how nanotechnology can enhance the effectiveness of this method in remediating hazardous waste sites Regulation of nanotechnology An important chapter that addresses the regulatory landscape of nanotechnology discussing the policies guidelines and challenges in ensuring safe deployment of nanoremediation technologies 1 2 3Trichloropropane The focus here is on the remediation of toxic chemicals such as 1 2 3Trichloropropane using advanced nanotechnology techniques to detoxify hazardous substances in the environment In situ chemical reduction This chapter examines in situ chemical reduction as a nanotechnology application for environmental cleanup discussing its practical uses and effectiveness in treating soil and groundwater contamination Air sparging Air sparging is explored as a technique for removing volatile contaminants from groundwater with a focus on how nanotechnology improves its efficiency and environmental benefits Nanotoxicology Nanotoxicology looks at the potential risks of nanomaterials assessing their environmental impact and safety concerns for human health and providing insight into how nanoremediation can mitigate these risks Zerovalent iron The chapter discusses zerovalent iron nanoparticles their application in removing contaminants from water and soil and how they provide a solution to environmental pollution

*Nanomaterials and Nanocomposites for Environmental Remediation* Swatantra P. Singh, Karthik Rathinam, Tarun Gupta, Avinash Kumar Agarwal, 2021 This monograph focuses on recent development of nanomaterials and nanocomposites



for pollution measurement and their control in water air and soil The contents incorporate carbon based metal based and metal organic framework based nanomaterials and nanocomposites for emerging contaminants pharmaceuticals and personal care products degradation disinfection and other traditional pollutants degradation and removal The book also offers updated literature for researchers and academicians working in the field of environmental remediation by nanomaterials Readers will learn about different metal and non metal based nanoparticles for environmental remediation It will be a useful guide for professionals and post graduate students involved in material science engineering chemical engineering and environmental nanotechnology research

**Emerging Trends of Nanotechnology in Environment and Sustainability** Karthiyayini Sridharan,2018-01-04 This book discusses nanotechnology its benefits and risks affecting the environment we live in today and is divided into three parts Part I dealing with Sustainability Part II describing Toxicological Impacts and Part III discussing Nanomaterial based Adsorbents The crucial challenge of sustainability in various environmental elements is a global problem This draws upon various issues of nanotechnology which impact sustainability of food clean environment green house gases raw materials extraction manufacturing and automobile industry Growth in the production of nanomaterials to suit any of these applications is commendable However this does not negate the growth in their toxic effects The nanotoxicity research in areas like medicine and agriculture industry is reviewed in detail in this book Part II discusses the toxic nature of widely used nanomaterials Nanomaterials are enormously used in environmental remediation due to some of their distinct properties These properties are described and discussed Part III of the book highlights the highly reactive and adsorbent properties of nanomaterials that enable them to be a competent agent in water and pollutant remediation This book is mainly intended for researchers and students to acquire fairly comprehensive understanding and appreciation of nanotechnology dominance in sustainability challenges with the aim to give the anticipatory governance of nanomaterials in our society and environment

*Nanotechnology* Louis Theodore,Robert G. Kunz,2005-04-08 An authoritative in depth exploration of the environmental consequences of nanotechnology Nanotechnology is revolutionizing the chemical telecom biotech pharmaceutical health care aerospace and computer industries among others and many exciting new nanotech applications are envisioned for the near future While the rapid pace of innovation has been truly inspiring much remains to be learned about the potential environmental and health risks posed by this nascent technology and its byproducts So important is this issue that the ultimate success or failure of nanotechnology may well depend on how effectively science and industry address these concerns in the years ahead Written by two highly accomplished environmental professionals Nanotechnology Environmental Implications and Solutions brings scientists engineers and policymakers up to speed on the current state of knowledge in this vitally important area Professor Theodore and Dr Kunz provide a concise review of nano fundamentals and explore background issues surrounding nanotechnology and its environmental impact They then follow up with in depth discussions of The control monitoring and

reduction of nanotech byproducts and their impact on the air water and land Health risks associated with nanotechnology and methods to assess and control them Nanotech hazard risk assessment including emergency response planning and personnel training Multimedia approaches that are available for the analysis of the impact of nanotechnology in the chemical manufacturing and waste disposal industries The future of nanotechnology and the Industrial Revolution II The legal implications of nanotechnology Societal and ethical implications of nanotechnology based materials and processing method Assuming only a basic knowledge of physics chemistry and mathematics on behalf of its readers Nanotechnology Environmental Implications and Solutions makes fascinating and useful reading for engineers scientists administrators environmental regulatory officials and public policy makers as well as students in a range of science and engineering disciplines

**Nanomaterials for Environmental Applications** Mohamed Abou El-Fetouh Barakat, Rajeev Kumar, 2022-02-03 Nanomaterials for Environmental Applications offers a comprehensive review of the latest advances in nanomaterials based technologies for the treatment of emerging contaminants in wastewater It describes the latest developments in the synthesis protocols including the synthesis of different kinds of nanostructure materials using various physical and chemical methods Features Discusses the synthesis and characterization of important nanomaterials such as carbon nanostructures metal and metal oxide nanostructures polymer nanostructures and smart 1D 3D nanomaterials Presents the latest techniques used in the characterization of nanomaterials Covers environmental applications including the remediation of pollutants in wastewater and water purification and disinfection Examines the sources fate transport and ecotoxicology of nanomaterials in the environment Aimed at researchers and industry professionals this work will be of interest to chemical environmental and materials engineers concerned with the application of advanced materials for environmental and water remediation Mohamed Abou El Fetouh Barakat is a Professor of Environmental Sciences at both King Abdulaziz University KAU Saudi Arabia and Central Metallurgical R D Institute CMRDI Egypt He is highly qualified in the fields of industrial waste management and pollution control as well as catalysis and nanotechnology His experience includes academic research works in Japan Germany the United States and Saudi Arabia as well as initiating and leading industrial research projects in Egypt jointly with the United States Rajeev Kumar is an Associate Professor in the Environmental Science Department King Abdulaziz University Jeddah Saudi Arabia His research activities are in the areas of wastewater treatment and materials science He studies the adsorption and photocatalytic properties of nanomaterials for the removal of contaminants from wastewater

*Nanoscale Zerovalent Iron Particles for Environmental Restoration* Tanapon Phenrat, Gregory V. Lowry, 2019-01-31 This is the first complete edited volume devoted to providing comprehensive and state of the art descriptions of science principles and pilot and field scaled engineering applications of nanoscale zerovalent iron particles NZVI for soil and groundwater remediation Although several books on environmental nanotechnology contain chapters of NZVI for environmental remediation Wiesner and Bottero 2007 Geiger and Carvalho Knighton 2009 Diallo et al

2009 Ram et al 2011 none of them include a comprehensive treatment of the fundamental and applied aspects of NZVI applications Most devote a chapter or two discussing a contemporary aspect of NZVI In addition environmental nanotechnology has a broad audience including environmental engineers and scientists geochemists material scientists physicists chemists biologists ecologists and toxicologists None of the current books contain enough background material for such multidisciplinary readers making it difficult for a graduate student or even an experienced researcher or environmental remediation practitioner new to nanotechnology to catch up with the massive undigested literature This prohibits the reader from gaining a complete understanding of NZVI science and technology In this volume the sixteen chapters are based on more than two decades of laboratory research and development and field scaled demonstrations of NZVI implementation The authors of each chapter are leading researchers and or practitioners in NZVI technology This book aims to be an important resource for all levels of audiences i e graduate students experienced environmental and nanotechnology researchers and practitioners evaluating environmental remediation as it is designed to involve everything from basic to advanced concepts

**Nanotechnology for Sustainable Agriculture, Food and Environment** Avnesh Kumari, Rajni Garg, Rishav Garg, 2023-10-31 Nanotechnology has the potential to drastically transform the agri food sector with its significant applications to improve agricultural productivity and the efficiency of agrochemicals The food sector has benefitted from the inclusion of nanoparticles in food matrixes and the nanoencapsulation of nutraceuticals Smart packaging materials designed with the help of nanotechnology have been used for increasing the shelf life of stored food products Nanomaterials have been extensively used for the delivery of important agrochemicals to enhance their bioefficacy prevent their degradation and control their release Various nanomaterials have been explored for remediation of arising environmental issues Nanotechnology has also made a useful contribution to the utilization of huge agricultural and food wastes for production of valuable products The existing and emerging applications of nanotechnology will contribute to environmental sustainability Nanotechnology for Sustainable Agriculture Food and Environment has been structured to provide a widespread coverage and up to date progress of nanotechnology and its applications in the agri food sector and environmental remediation Synthesis of value added nanomaterials from agri food wastes and their potential applications in environmental remediation have been explored In addition toxicity issues with nanomaterials have also been discussed Features Elaborated information on the use of nanotechnology for sustainable agriculture In depth study about valorization of agri food waste An overview of applications of nanotechnology in environmental remediation Toxicity analysis of nanotechnology based products We aim to satisfy the need for a reference book for scientists researchers academicians and students in nanotechnology agricultural food nutraceuticals environmental and material sectors

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## Nanotechnology For Environmental Remediation Introduction

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