

BIOSORBENTS FOR METAL IONS

Edited by

John Wase

and Christopher Forster



Biosorbents For Metal Ions

**Tulasi Satyanarayana, Sunil K.
Deshmukh, B.N. Johri**



Biosorbents For Metal Ions:

Biosorbents for Metal Ions D A John Wase, John Wase, 1997-08-05 Metals can be dispersed both naturally and by man's activities into any of the Earth's elements soil water or air Biological techniques for removing metal pollutants from soil air or water are now attracting great interest both because they are seen as more environmentally friendly than chemical treatments and because in some cases at least

Microbial Biosorption of Metals Pavel Kotrba, Martina Mackova, Tomas Macek, 2011-01-13 Heavy metals always pose serious ecological risks when released into the environment due to their elemental non degradable nature regardless of their chemical form This calls for the development of efficient and low cost effluent treatment and metal recuperation technologies for contaminated waste water not only because regulatory limits need to be met but also because the waste itself can be a resource for certain precious metals Biosorption is a general property of living and dead biomass to rapidly bind and abiotically concentrate inorganic or organic compounds from even very diluted aqueous solutions As a specific term biosorption is a method that utilizes materials of biological origin biosorbents formulated from non living biomass for the removal of target substances from aqueous solutions Recent research on biosorption provides a solid understanding of the mechanism underlying microbial biosorption of heavy metals and related elements This book gathers review articles analyzing current views on the mechanism and bio chemistry of biosorption the performance of bacterial fungal and algal biomass and the practical aspects of biosorbent preparation and engineering It also reviews the physico chemical evaluations of biosorbents and modelling of the process as well as the importance of biosorption during heavy metal removal using living cells It is a reference work for scientists environmental safety engineers and R D specialists who wish to further promote biosorption research and use the accumulated knowledge to develop and build industrial applications of biosorption in heavy metal separation technologies

Biosorption Processes for Heavy Metal Removal Saini, Pinki, 2024-03-11 Persistent and non degradable heavy metals stand as pollutants with the potential for severe ecological repercussions when released into the environment Municipal and industrial wastewater face a high risk of contamination by these hazardous substances posing a formidable challenge to water treatment technologies The imperative is clear effective and affordable methods for effluent treatment and metal recovery are essential for meeting regulatory standards and unlocking the latent value of valuable metals within the waste However new methods of accomplishing this challenge are necessary for increasing the effectiveness in both cost and application Biosorption Processes for Heavy Metal Removal comprehensively explores the imperative to remove heavy metals from waste streams It provides an insightful overview of biosorbents and biosorption technology focusing on their underlying biosorption features The compilation within this book comprises of a series of review articles delving into the current understanding of biosorption mechanisms and biochemistry the efficacy of bacterial fungal and algal biomass and practical considerations for biosorbent preparation and engineering The physicochemical evaluations of biosorbents process optimization and factors influencing biosorption

efficiency are also covered Furthermore the book explores biosorption applications for removing nutrients organic pollutants and metals in wastewater treatment across diverse contexts Geared towards administrators policymakers consultants industry professionals academicians scientists researchers and graduate and post graduate students in environmental sciences and related fields this book serves as their comprehensive reference **Biosorbents** Pramod Kumar Mahish,Dakeshwar Kumar Verma,Shailesh Kumar Jadhav,2024-03-11 This book focuses on the biologically derived adsorbent with numerous applications in wastewater treatment metal recovery biosensor development and so forth It initiates with the description of biological sources of biosorbents followed by applications of biosorbents biosorption isotherms assessment of biosorbents with various tools pretreatment of biosorbents and its mode of action Some less explored areas like separation of radionuclides biosorption of volatile organic compounds and animal based biosorbents are also explained Features Focuses on fundamentals characteristics of flora and fauna mediated biosorbents used extensively Describes entire aspects of tools and techniques related to assessment and monitoring of biosorbents Includes adsorption kinetics adsorption isotherm and mechanism of action of biosorbents Covers advancements in pretreatment methods to enhance the adsorption process of biosorbents Reviews recent applications which include heavy metal removal dye remediation and separation of radionuclides and nano biosorbents This book is aimed at graduate students and researchers in bioprocess engineering microbiology and biotechnology

Biosorption of Heavy Metals Bohumil Volesky,1990-08-15 This state of the art volume represents the first comprehensively written book which focuses on the new field of biosorption This fascinating work conveys essential fundamental information and outlines the perspectives of biosorption It summarizes the metal sorbing properties of nonliving bacterial fungal and algal biomass plus highlights relevant metal binding mechanisms This volume also discusses the aspects of obtaining and processing microbial biomass and metal chelating chemicals into industrially applicable biosorbent products Microbiologists chemists and engineers with an interest in new technological and scientific horizons will find this reference indispensable

Microbial Biosorption of Metals Pavel Kotrba,Martina Mackova,Tomas Macek,2011-03-30 Heavy metals always pose serious ecological risks when released into the environment due to their elemental non degradable nature regardless of their chemical form This calls for the development of efficient and low cost effluent treatment and metal recuperation technologies for contaminated waste water not only because regulatory limits need to be met but also because the waste itself can be a resource for certain precious metals Biosorption is a general property of living and dead biomass to rapidly bind and abiotically concentrate inorganic or organic compounds from even very diluted aqueous solutions As a specific term biosorption is a method that utilizes materials of biological origin biosorbents formulated from non living biomass for the removal of target substances from aqueous solutions Recent research on biosorption provides a solid understanding of the mechanism underlying microbial biosorption of heavy metals and related elements This book gathers review articles analyzing current views on the mechanism and bio chemistry of biosorption the performance of bacterial

fungal and algal biomass and the practical aspects of biosorbent preparation and engineering. It also reviews the physico-chemical evaluations of biosorbents and modelling of the process as well as the importance of biosorption during heavy metal removal using living cells. It is a reference work for scientists, environmental safety engineers and R D specialists who wish to further promote biosorption research and use the accumulated knowledge to develop and build industrial applications of biosorption in heavy metal separation technologies.

Milestones in Powerful Adsorbents of Heavy-Metal Ions Xin-Gui Li, Mei-Rong Huang, 2024-04-02. Serious challenges instigated by pollution are driving research seeking feasible strategies for social economic and environmental sustainability. The fascinating science of selective adsorbents of heavy or precious metal pollutants such as lead, mercury, gold and silver ions has attracted investigation by many capable materials scientists, chemists and environmental engineers, resulting in rapidly increasing progress with time. This book reveals theoretical and practical information that will assist in the study, research and innovations of effective adsorbents towards toxic and noble metal ions. It allows the reader to pursue an answer to this mystery through interdisciplinary scientific knowledge of material design, synthesis and environmental purification of strong adsorbents as has never been presented systematically before, demonstrating the nature of the unique molecular and morphological structures of the adsorbent and how to design and optimize molecular and material structures.

Biosorption for Wastewater Contaminants Rangabhashiyam Selvasembian, Pardeep Singh, 2021-10-25. Pollution due to various anthropogenic activities continues to increase. In terms of water pollutants, organic and inorganic pollutants are the most problematic. Although several measures have been proposed and implemented to prevent or reduce contamination, their increased concentration in water bodies has created serious concerns. Over the years, the problem has been aggravated by industrialization, urbanization and the exploitation of natural resources. The direct discharge of wastewater contaminants and their geographical mobilization have caused an increase in concentration in ground surface, fluvial and residual waters. Extensive information about detection and disposal methods is needed in order to develop technological solutions for a variety of environments, both urban and rural. This book provides up to date information on wastewater contaminants aimed at researchers, engineers and technologists working in this field. Conventional physicochemical techniques used to remove contaminants from wastewater include ion exchange, precipitation, degradation, coagulation, coating, membrane processes and adsorption. However, these applications have technological and economic limitations and involve the release of large amounts of chemical reagents and by-products that are themselves difficult to remove. Biosorption, the use of organically generated material as an adsorbent, is attracting new research and scholarship. Thermally treated calcined biomaterials may be treated to remove heavy metals from wastewater. To ensure the elimination of these contaminants, existing solutions must be integrated with intelligent biosorption functions. Biosorption for Wastewater Contaminants will find an appreciative audience among academics and postgraduates working in the fields of environmental biotechnology, environmental engineering, wastewater treatment technology and environmental chemistry.

Microbial Biotechnology: Principles And Applications (3rd Edition) Yuan Kun Lee, 2013-01-30 The rapidly expanding molecular biological techniques and approaches have significant impact on microbial biotechnology hence the need for the addition of four new chapters in the third edition of this textbook Chapter 3 Application of Omics Technologies in Microbial Fermentation Chapter 5 Microbial Genome Mining for Identifying Antimicrobial Targets Chapter 21 Bacterial Biofilm Molecular Characterization and Impacts on Water Management and Chapter 23 Microbial Biomineralization Chapter 15 Transgenic Plants has been completely revised while most of the other chapters have been thoroughly updated in this new edition There already exist a number of excellent general textbooks on microbiology and biotechnology that deal with the basic principles of microbial biotechnology To complement them this book focuses on the various applications of microbial biotechnological principles A teaching based format is adopted whereby working problems as well as answers to frequently asked questions supplement the main text The book also includes real life examples of how the application of microbial biotechnological principles has achieved breakthroughs in both research and industrial production Although written for polytechnic students and undergraduates the book contains sufficient information to be used as a reference for postgraduate students and lecturers It may also serve as a resource book for corporate planners managers and applied research personnel

Microbial Biotechnology: Principles And Applications Yuan Kun Lee, Azlinda Anwar, 2003-09-15 Life science research and industry is developing rapidly all over the world Microbial biotechnology is increasingly being regarded as a core subject in most university and polytechnic life science courses There already exist a number of excellent general textbooks on microbiology and biotechnology that deal with the basic principles of the field To complement them this book focuses on the various applications of microbial biotechnological principles A teaching based format is adopted whereby working problems as well as answers to frequently asked questions supplement the main text The book also includes real life examples of how the application of microbial biotechnological principles has achieved breakthroughs in both research and industrial production Although Microbial Biotechnology has been written for polytechnic students and undergraduates it contains sufficient information to be used as a reference for postgraduate students and lecturers It may also serve as a resource book for corporate planners managers and applied research personnel

Decontamination of Heavy Metals Jiaping Paul Chen, 2012-12-18 Heavy metals such as lead chromium cadmium zinc copper and nickel are important constituents of most living organisms as well as many nonliving substances Some heavy metals are essential for growth of biological and microbiological lives yet their presence in excessive quantities is harmful to humans and interferes with many environmental

Heavy Metal Contamination in the Environment Veer Singh, Ashish Kumar, Vishal Mishra, Sachchida Nand Rai, 2024-12-30 This reference book explores the multifaceted problem of heavy metal contamination in the environment Through its in depth analysis the book provides a thorough overview of the sources and pathways of heavy metals their persistence in ecosystems and the resulting health impacts on individuals and ecosystems The chapters explore the diverse

sources of contamination including industrial activities mining agriculture and urbanization while examining the types of heavy metals found in the environment and their toxicological properties The book further reviews the profound health effects associated with heavy metal exposure such as neurological disorders developmental abnormalities carcinogenicity and organ damage Furthermore the book provides insights into risk assessment methodologies regulatory frameworks and guidelines aimed at controlling and minimizing heavy metal exposure It highlights the challenges and gaps in current regulations identifies potential areas for improvement and presents analytical techniques for heavy metal analysis and removal This book is an important source for researchers and professionals working in the fields of environmental science toxicology and public health

Springer Handbook of Marine Biotechnology Se-Kwon Kim, 2015-01-21 This Springer Handbook provides for the first time a complete and consistent overview over the methods applications and products in the field of marine biotechnology A large portion of the surface of the earth ca 70% is covered by the oceans More than 80% of the living organisms on the earth are found in aquatic ecosystems The aquatic systems thus constitute a rich reservoir for various chemical materials and bio chemical processes Edited by a renowned expert with a longstanding experience and including over 60 contributions from leading international scientists the Springer Handbook of Marine Biotechnology is a major authoritative desk reference for everyone interested or working in the field of marine biotechnology and bioprocessing from undergraduate and graduate students over scientists and teachers to professionals Marine biotechnology is concerned with the study of biochemical materials and processes from marine sources that play a vital role in the isolation of novel drugs and to bring them to industrial and pharmaceutical development Today a multitude of bioprocess techniques is employed to isolate and produce marine natural compounds novel biomaterials or proteins and enzymes from marine organisms and to bring them to applications as pharmaceuticals cosmeceuticals or nutraceuticals or for the production of bioenergy from marine sources All these topics are addressed by the Springer Handbook of Marine Biotechnology The book is divided into ten parts Each part is consistently organized so that the handbook provides a sound introduction to marine biotechnology from historical backgrounds and the fundamentals over the description of the methods and technology to their applications but it can also be used as a reference work Key topics include Marine flora and fauna Tools and methods in marine biotechnology Marine genomics Marine microbiology Bioenergy and biofuels Marine bioproducts in industrial applications Marine bioproducts in medical and pharmaceutical applications and many more

Environmental Biotechnology Volume 4 K. M. Gothandam, Ramachandran Srinivasan, Shivendu Ranjan, Nandita Dasgupta, Eric Lichtfouse, 2021-09-24 This book reviews the production of bioplastic from various raw materials and recycling wastewater into useful bioproducts by bacteria In addition it also addresses the recent advancement in pest control in rice plants different methods to analyse genotoxicity on soil samples and the effect of phytocompounds on acrylamide induced toxicity in *Drosophilla* Interestingly this book also discusses mesoporous silica nanoparticles role as nanocarrier material for inhibiting

the cancer cell especially breast cancer and various biotechnological applications of marine fungal exopolysaccharides

Developments in Fungal Biology and Applied Mycology Tulasi Satyanarayana, Sunil K. Deshmukh, B.N.

Johri, 2017-12-29 This book explores the developments in important aspects of fungi related to the environment industrial mycology microbiology biotechnology and agriculture It discusses at length both basic and applied aspects of fungi and provides up to date laboratory based data Of the estimated three million species of fungi on Earth according to Hawksworth and coworkers more than 100 000 have been described to date Many fungi produce toxins organic acids antibiotics and other secondary metabolites and are sources of useful biocatalysts such as cellulases xylanases proteases and pectinases to mention a few They can also cause diseases in animals as well as plants and many are able to break down complex organic molecules such as lignin and pollutants like xenobiotics petroleum and polycyclic aromatic compounds Current research on mushrooms focuses on their hypoglycemic anti cancer anti pathogenic and immunity enhancing activities This ready reference resource on various aspects of fungi is intended for graduate and post graduate students as well as researchers in life sciences microbiology botany environmental sciences and biotechnology

Bio-organic Amendments for Heavy Metal Remediation Allah Ditta, Sajid Mehmood, Muhammad Imtiaz, Mike S Tu, 2024-07-23 Bio organic Amendments for Heavy Metal Remediation Water soil and plant focuses on these core continuum media to explore remediation options using microbial organic and combined approaches A volume in the Plant Biology Sustainability and Climate Change series this book offers a comprehensive view of techniques and approaches for addressing contamination by heavy metals As anthropogenic activities increasingly negatively impact natural resources there has been significant disturbance of water soil and plant continuum due to the accumulation of heavy metals The bioaccumulation of heavy metals in the food chain could pose life threatening effects on plants as well as humans and there is need to find effective and sustainable remediation options The application of bio organic amendments could serve as a sustainable solution to this problem Employing microbial organic and combined approaches to reduce the accumulation of heavy metals in the food chain ultimately would lead to the production of safe food for humans This book provides a comprehensive view of the challenge with a focus on the bioremediation of heavy metals contamination using ecotechnological approaches to protecting the soil water and plant continuum Highlights remediation techniques approaches for heavy metals under water soil and plant continuums Presents case studies for real world insights as well as current practices Includes regulatory aspects for ensuring safe implementation

Groundwater Resource Management Planning Strategies Vangala Sunitha, Bandi Muralidhara Reddy, Yenugu Sudharshan Reddy, Mannala Prasad, Badapalli Pradeep Kumar, Etikala Balaji, 2025-07-18

Geospatial tools to Groundwater Resources explain the most recent methods in Geographic Information Systems GIS and geostatistics as they apply to groundwater through complete case studies that demonstrate actual remote sensing applications in this field Due to the rising demand for water its decreasing quality and its limited supply water resource management has grown to be a serious issue In many places of the

world groundwater is the main supply of fresh water but certain areas are growing unduly reliant on it utilising groundwater more quickly than it can be replenished naturally and resulting in an unceasing decrease in water tables For the efficient use management and modelling of this priceless but diminishing natural resource systematic planning of groundwater consumption using current approaches is crucial Remote sensing GIS GPS Global Positioning Systems and geostatistical approaches are among the effective water management methods that have developed with the introduction of powerful and fast personal computers Now more than ever it is possible to analyse with greater accuracy the relationships between environmental elements and human health and wellbeing Our understanding of the continuum between environment and health consequences on many different sizes from the global to even the individual has evolved thanks to a number of transdisciplinary accomplishments This book covers a wide range of geospatial health related topics and methods including climate change healthcare utilisation health disparities air quality assessment asthma water quality assessment and machine learning It also advances scientific understanding development and application of geospatial technologies related to water resource management Researchers and postgraduate students in Earth and Environmental Sciences particularly GIS agriculture hydrology natural resources and soil science who need to be able to apply the most recent innovations in groundwater research in a practical way will find Case Studies in Geospatial Applications to Groundwater Resources to be a valuable resource This edited volume will concentrate on the most recent studies and uses of geospatial methods in water resource management offering insights into the difficulties and possibilities of applying these methods to solve practical issues

Heavy Metal Contamination in Wastewater and Its Bioremediation by Microbial-Based Approaches Veer Singh, Vishal Mishra, Sachchida Nand Rai, Maulin P. Shah, 2025-10-09 This book covers various aspects of heavy metal contamination in wastewater and its removal by microbial based approaches The heavy metal contamination in water is generally caused due to natural and anthropogenic activities There are many industrial processes responsible for such a contamination for example leather tanning coal washeries agriculture activities chrome plating and paint industries The industrial effluent directly or indirectly discharges into water sources and heavy metal containing wastewater decreases the quality of surface water and groundwater The heavy metal contamination causes various types of health issues in human and other living organisms including kidney and liver damage heart failure mental retardation cancers and skin and gastric problems The high level of heavy metal concentration in the cell generates reactive oxygen species ROS which may cause damage to cell organelles Due to their high toxicity there is an urgent need to develop effective heavy metal removal method for wastewater treatment There are several conventional methods available for the removal of heavy metal ions from contaminated sites These methods have some disadvantages such as the generation of secondary toxic sludge and high operation cost Hence it is required to develop cost effective and eco friendly methods for decontamination Microorganisms have tendency to accumulate heavy metal ions into their intracellular space and can grow in various high stress

environments and microbial based methods are considered as eco friendly and cost effective Moreover the integrated approach of wastewater treatment and utilization of microbial biomass for bioenergy production can be beneficial in terms of heavy metal bioremediation and zero waste generation This book focuses on the heavy metal contamination their toxicity and microbial methods for the removal of heavy metal ions from contaminated sites **Green Adsorbents to Remove Metals, Dyes and Boron from Polluted Water** Inamuddin,Mohd Imran Ahamed,Eric Lichtfouse,Abdullah M. Asiri,2020-08-31 This book reviews adsorption techniques to clean wastewater with focus on pollution by dyes and heavy metals Advanced adsorbents include carbon nanomaterials biomass cellulose polymers clay composites and chelating materials

Environmental Microbiology Maulin Shah,2022-09-06 This book highlights the importance of various emerging technologies that are used to clean up the environment from pollution caused by human activities It assesses several existing applied and environmental microbiological techniques and introduces new technologies through applied aspects Select topics covered include municipal wastewater treatment environmental microorganisms metal pollutants in the environment and biogeochemical cycling

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