

Anaerobic Reactors Biological Wastewater Treatment Volume 4 Biological Wastewater Treatment Series By De Lemos Chernicharo Carlos Augusto 2007 Paperback

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Environmental Anaerobic Technology - Herbert H. P. Fang 2010

Anaerobic technology has become widely accepted by the environmental industry as a cost-effective alternative to the conventional aerobic process. This makes anaerobic process the favored green treatment technology for sustainable environment in years to come. Written by world-renowned authors, this compendium summarizes the successful full-scale application experiences of anaerobic technology worldwide, including not just food, beverage, and distillery wastewaters but also municipal, agricultural, chemical and petrochemical wastewaters. The book also introduces new developments of anaerobic technology, including pretreatment and granulation technologies, membrane bioreactor, two-stage treatment, bio-hydrogen production, molecular techniques, and modeling .

Wastewater Characteristics, Treatment and Disposal - Marcos Von Sperling 2007-03-30
Wastewater Characteristics, Treatment and Disposal is the first volume in the series Biological Wastewater Treatment, presenting an integrated view of water quality and wastewater treatment. The book covers the following topics: wastewater characteristics (flow and major constituents) impact of wastewater discharges to rivers and lakes overview of wastewater treatment systems complementary items in planning studies. This book, with its clear and practical approach, lays the foundations for the topics that are analysed in more detail in the other books of the series. About the series: The series is based on a highly acclaimed set of best selling textbooks. This international version is comprised by six textbooks giving a state-of-the-art presentation of the science and technology of biological wastewater treatment. Other titles in the series are: Volume 2: Basic Principles of Wastewater Treatment; Volume 3: Waste Stabilisation Ponds; Volume 4: Anaerobic Reactors; Volume 5: Activated Sludge and Aerobic Biofilm Reactors; Volume 6: Sludge Treatment and Disposal

Biology of Wastewater Treatment - N F Gray 2004-04-06

This comprehensive text provides the reader with both a detailed reference and a unified course on wastewater treatment. Aimed at scientists and engineers, it deals with the environmental and biological aspects of wastewater treatment and sludge disposal. The book starts by examining the nature of wastewaters and how they are oxidized in the natural environment. An introductory chapter deals with wastewater treatment systems and examines how natural principles have been harnessed by man to treat his own waste in specialist reactors. The role of organisms is considered by looking at kinetics, metabolism and the different types of micro-organisms involved. All the major biological process groups are examined in detail, in highly referenced chapters; they include fixed film reactors, activated sludge, stabilization ponds, anaerobic systems and vegetative processes. Sludge treatment and disposal is examined with particular reference to the environmental problems associated with the various disposal routes. A

comprehensive chapter on public health looks at the important waterborne organisms associated with disease, as well as removal processes within treatment systems. Biotechnology has had an enormous impact on wastewater treatment at every level, and this is explored in terms of resource reuse, biological conversion processes and environmental protection. Finally, there is a short concluding chapter that looks at the sustainability of waste water treatment. The text is fully illustrated and supported by over 3000 references. Contents:How Nature Deals with WasteHow Man Deals with WasteThe Role of OrganismsFixed-Film ReactorsActivated SludgeNatural Treatment SystemsAnaerobic Unit ProcessesSludge Treatment and DisposalPublic HealthBiotechnology and Wastewater Treatment Readership: Graduate students in wastewater technology. Reviews:"Anyone interested in the biology of wastewater treatment will find this book useful."Biotechnology Advances "... is both well written and informative and it should appeal to anyone with an interest in wastewater treatment. It covers the ground in sufficient depth to stay useful throughout one's entire career, serving as an essential reference, allowing one to dive in and out at will as one's needs dictate ... manages to fulfil what I believe to be its aim of bridging the gap between wastewater engineering and its underlying biology."Journal of the Chartered Institution of Water and Environmental Management

Handbook of Biological Wastewater Treatment - Adrianus van Haandel 2012-02-20

The scope of this comprehensive new edition of Handbook of Biological Wastewater Treatment ranges from the design of the activated sludge system, final settlers, auxiliary units (sludge thickeners and digesters) to pre-treatment units such as primary settlers and UASB reactors. The core of the book deals with the optimized design of biological and chemical nutrient removal. The book presents the state-of-the-art theory concerning the various aspects of the activated sludge system and develops procedures for optimized cost-based design and operation. It offers a truly integrated cost-based design method that can be easily implemented in spreadsheets and adapted to the particular needs of the user. Handbook of Biological Wastewater Treatment: Second Edition incorporates valuable new material that improves the instructive qualities of the first edition. The book has a new structure that makes the material more readily understandable and the numerous additional examples clarify the text. On the website www.wastewaterhandbook.com three free excel design spreadsheets for different configurations (secondary treatment with and without primary settling and nitrogen removal) can be downloaded to get the reader started with their own design projects. New sections have been added throughout: to explain the difference between true and apparent yield while the section on the F/M ratio, and especially the reasons not to use it, has been expanded; to demonstrate the effect of the oxygen recycle to the anoxic zones on both the denitrification capacity and the concept of available nitrate is explained in more detail. the latest developments on the causes and solution

to sludge bulking and scum formation to show the rapid developments of innovative nitrogen removal and sludge separation problems the anaerobic pre-treatment section is completely rewritten based on the experiences obtained from an extensive review of large full-scale UASB based sewage treatment plants a new section on industrial anaerobic wastewater treatment three new appendices have been added. These deal with the calibration of the denitrification model, empirical design guidelines for final settler design (STORA/STOWA and ATV) and with the potential for development of denitrification in the final settler. A new chapter on moving bed biofilm reactors Handbook of Biological Wastewater Treatment: Second Edition is written for post graduate students and engineers in consulting firms and environmental protection agencies. It is an invaluable resource for everybody working in the field of wastewater treatment. Lecturer support material is available when adopted for university courses. This includes course material for the first 7 modules in the form of PDF printouts and an exercise file with questions and answers and a symbol list. Authors: Prof. dr. ir. A.C. van Haandel, Federal University of Campina Grande - Brazil and Ir. J.G.M. van der Lubbe, Biothane Systems International - Veolia, The Netherlands

Anaerobic Reactors - Carlos Augustos de Lemos Chernicharo 2007-03-30

Anaerobic Reactors is the fourth volume in the series Biological Wastewater Treatment. The fundamentals of anaerobic treatment are presented in detail, including its applicability, microbiology, biochemistry and main reactor configurations. Two reactor types are analysed in more detail, namely anaerobic filters and especially UASB (upflow anaerobic sludge blanket) reactors. Particular attention is also devoted to the post-treatment of the effluents from the anaerobic reactors. The book presents in a clear and informative way the main concepts, working principles, expected removal efficiencies, design criteria, design examples, construction aspects and operational guidelines for anaerobic reactors. About the series: The series is based on a highly acclaimed set of best selling textbooks. This international version is comprised by six textbooks giving a state-of-the-art presentation of the science and technology of biological wastewater treatment. Other titles in the series are: Volume 1: Waste Stabilisation Ponds; Volume 2: Basic Principles of Wastewater Treatment; Volume 3: Waste Stabilization Ponds; Volume 5: Activated Sludge and Aerobic Biofilm Reactors; Volume 6: Sludge Treatment and Disposal **Biological Wastewater Treatment in Warm Climate Regions** - Marcos Von Sperling 2005-09-30

Biological Wastewater Treatment in Warm Climate Regions gives a state-of-the-art presentation of the science and technology of biological wastewater treatment, particularly domestic sewage. The book covers the main treatment processes used worldwide with wastewater treatment in warm climate regions given a particular emphasis where simple, affordable and sustainable solutions are required. This comprehensive book presents in a clear and informative way the basic principles of biological wastewater treatment, including theory and practice, and covering conception, design and operation. In order to ensure the practical and didactic view of the book, 371 illustrations, 322 summary tables and 117 examples are included. All major wastewater treatment processes are covered by full and interlinked design examples which are built up throughout the book, from the determination of wastewater characteristics, the impact of discharge into rivers and lakes, the design of several wastewater treatment processes and the design of sludge treatment and disposal units. The 55 chapters are divided into 7 parts over two volumes: Volume One: (1) Introduction to wastewater characteristics, treatment and disposal; (2) Basic principles of wastewater treatment; (3) Stabilisation ponds; (4) Anaerobic reactors; Volume Two: (5) Activated sludge; (6) Aerobic biofilm reactors; (7) Sludge treatment and disposal. As well as being an ideal textbook, Biological Wastewater Treatment in Warm Climate Regions is an important reference for practising professionals such as engineers, biologists, chemists and environmental scientists, acting in consulting companies, water authorities and environmental agencies.

Effect of Acid and Base Pretreatment on the Anaerobic Digestion of Excess Municipal Sludge -

2005

The treatment and disposal of sewage sludge is a growing problem worldwide due to the continuing increase in sludge production from biological wastewater treatment plants and recent stringent regulations regarding sludge treatment and disposal. To date, the primary disposal methods for the excess sludge produced are landfilling, incineration and application in agricultural or forestland [1]. The high water content of the sludge makes incineration expensive and faces restrictions on disposal in modern landfills due to the tendency to reduce the amount of organic matter applied. Agricultural use seems to be the best options but several constraints exist due to health related problems such as odors, heavy metals content or pathogens and hazardous compounds that may be present in the sludge preventing their use in farming [2]. In this context, anaerobic sludge digestion represents a good sludge treatment alternative, decreasing the amount of solids present in the sludge with consequent reductions in disposal cost. Furthermore, we have to consider the advantage represented by energy recovery in the form of methane production that can be utilized as an energy source at the facility [3]. The present research project evaluates the combined use of hydrochloric acid (HCl) and sodium hydroxide (NaOH) for sludge chemical pretreatment to improve the performance of anaerobic digestion by extending the effectiveness of solids hydrolysis which is considered the rate-limiting step in the process [4]. The effect of temperature and the length of pre-treatment were initially evaluated to optimize the pretreatment process prior to use of any anaerobic treatment. Once the results of this experiment are analyzed, the performance of anaerobic digestion with chemical pretreatment using different combinations of primary and waste activated sludge pretreatment with either acid or base was studied. Two different SRTs for anaerobic digestion, 10 and 20 days, were investigated using duplicate reactors for each condition. Two reactors (number 1 and 6), used as control, were fed with a mixture of untreated primary and waste activated sludge in a mass ratio 1:1 with a combined VSS concentration around 30 g/l. Two reactors (number 2 and 4) were fed with a mixture of primary sludge pretreated with HCl and activated sludge pretreated with NaOH. The last two reactors (number 3 and 5) were fed with a mixture of primary sludge treated with NaOH and activated sludge treated with HCl. The same primary and waste activated sludge mass ratio as the one used to feed the control reactors were maintained in the four reactors fed with the chemically pretreated sludge. Monitored parameters were: TSS, VSS, total and soluble COD, Total Kjeldahl Nitrogen (TKN), Ammonia, Volatile Fatty Acids (VFA), pH, Phosphates, metals concentration, fecal coliforms concentration and gas production and composition. As expected, the results showed that 20 days SRT provided higher VSS and COD removal than 10 days SRT for all the three configurations evaluated. For both SRTs, the mixture of primary sludge treated with NaOH and activated sludge treated with HCl resulted in higher VSS and COD removal. VSS removal averaged from 37.2% in reactor 1 and 38.6% in reactor 6 for the 10 days SRT. Increasing the SRT to 20 days led to 46.6% and 44% VSS removal for reactor 1 and 6, respectively. Reactors 2 and 4 led to an overall average VSS removal of 44% for the 10 days SRT experiment which increased to around 50% in both reactors during the 20 days SRT experiment. For both SRTs, reactors 3 and 5 provided the highest average solids reduction with values around 46% for 10 days treatment and close to 53% for 20 days SRT (Chapter 7.2.1). It has to be considered that, in terms of maximum solids destruction, for the 10 days SRT experiment, a highest solids removal value of 47.8% was achieved in reactor 3 while 56.7% removal was obtained in reactor 5 when the SRT increased to 20 days. A similar trend was obtained when the COD removal has been considered. The two control reactors, 1 and 6, averaged from the 37.2% and 38.1% removal for the 10 days SRT experiment to values around 45% when the SRT was increased to 20 days. An overall average COD removal of 44.5 and 43.2% was achieved in reactors 2 and 4, respectively, for the 10 days SRT experiment and increased to around 47% in both reactors when the SRT was increased to 20 days. For both SRTs, reactors 3 and 5 provided the highest average COD removal with values around 45% for 10 days treatment experiment and close to 51% for 20 days SRT. For both retention times, all reactors exhibited good reproducibility in the replicates. Volatile fatty

acids (VFAs) concentration was very low for both 10 and 20 days SRT in all reactors and weekly gas analysis exhibited a methane content of approximately 65%, meaning good overall performance of anaerobic digestion. The research proposed showed that anaerobic sludge digestion can be successfully used as sludge treatment alternative to reduce the amount of solids present in the sludge, with consequent reductions in disposal costs. Furthermore, compared with other sludge pretreatment options, the combined use of strong acid and strong base as chemical sludge pretreatment resulted in a good balance between solids reduction, process stability and cost reduction.

Hygienic Design of Food Factories - John Holah 2011-10-26

Food safety is vital for consumer confidence, and the hygienic design of food processing facilities is central to the manufacture of safe products. Hygienic design of food factories provides an authoritative overview of hygiene control in the design, construction and renovation of food factories. The business case for a new or refurbished food factory, its equipment needs and the impacts on factory design and construction are considered in two introductory chapters. Part one then reviews the implications of hygiene and construction regulation in various countries on food factory design. Retailer requirements are also discussed. Part two describes site selection, factory layout and the associated issue of airflow. Parts three, four and five then address the hygienic design of essential parts of a food factory. These include walls, ceilings, floors, selected utility and process support systems, entry and exit points, storage areas and changing rooms. Lastly part six covers the management of building work and factory inspection when commissioning the plant. With its distinguished editors and international team of contributors, Hygienic design of food factories is an essential reference for managers of food factories, food plant engineers and all those with an academic research interest in the field. An authoritative overview of hygiene control in the design, construction and renovation of food factories Examines the implications of hygiene and construction regulation in various countries on food factory design Describes site selection, factory layout and the associated issue of airflow

Biomethanization of the Organic Fraction of Municipal Solid Wastes - J. Mata-Alvarez 2002-08-31

Biomethanization of the Organic Fraction of Municipal Solid Wastes is a comprehensive introduction to both the fundamentals and the more practical aspects of the anaerobic digestion of organic solid wastes, particularly those derived from households, that is, the organic fraction of municipal solid wastes (OFMSW). It can be used as a textbook for specialized courses and also as a guide for practitioners. In the first part, the book covers the relevant aspects of anaerobic digestion (AD) of organic wastes. The fundamentals and kinetic aspects of AD are reviewed with particular emphasis on the aspects related to solid wastes. This introduction is necessary to have a comprehensive view of the AD process and to understand the practical principles as well as the origin of possible problems arising from the management of the process. Chapter 2 emphasizes the role of kinetics in designing the reactor, paying special attention to existing models, particularly the dynamic ones. Through this introduction, it is intended to facilitate the technology transfer from laboratory or pilot plant experiences to full-scale process, in order to implement improvements in current digesters. Laboratory methods are described for the analysis and optimization of reactor performance, such as methanogenic activity tests or experimental evaluation of the biodegradation kinetics of solid organic waste. The different reaction patterns applied to industrial reactors are outlined. Industrial reactors are classified in accordance with the system they use, pointing out advantages and limitations. Co-digestion, enabling the co-treatment of organic wastes of different origin in a more economically feasible way, is described in detail. Examples of co-digestion are given, with OFMSW as a base-substrate. Finally, full-scale co-digestion plants are discussed. Various types (mechanical, biological, physico-chemical) of pre-treatment to increase the biodegradability, and thus the yields of the process, are reviewed in detail. The use of the fermentation products of anaerobic digesters for biological nutrient removal processes in wastewater treatment plants is described. This constitutes an example of integrated waste management, a field in which both economic and technical advances can be achieved.

Balances are given to justify the approach, and a full-scale case study is presented. The important topic of economics and the ecological advantages of the process are emphasized. The use of compost, the integration with composting technology, and advantages over other technologies are detailed in the framework of an environmental impact assessment of biowaste treatment. Finally, the anaerobic digestion of MSW in landfills is reviewed in detail, with emphasis on landfill process enhancement and strategies for its application.

The Biogas Handbook - Arthur Wellinger 2013-02-19

With pressure increasing to utilise wastes and residues effectively and sustainably, the production of biogas represents one of the most important routes towards reaching national and international renewable energy targets. The biogas handbook: Science, production and applications provides a comprehensive and systematic guide to the development and deployment of biogas supply chains and technology. Following a concise overview of biogas as an energy option, part one explores biomass resources and fundamental science and engineering of biogas production, including feedstock characterisation, storage and pre-treatment, and yield optimisation. Plant design, engineering, process optimisation and digestate utilisation are the focus of part two. Topics considered include the engineering and process control of biogas plants, methane emissions in biogas production, and biogas digestate quality, utilisation and land application. Finally, part three discusses international experience and best practice in biogas utilisation. Biogas cleaning and upgrading to biomethane, biomethane use as transport fuel and the generation of heat and power from biogas for stationery applications are all discussed. The book concludes with a review of market development and biomethane certification schemes. With its distinguished editors and international team of expert contributors, The biogas handbook: Science, production and applications is a practical reference to biogas technology for process engineers, manufacturers, industrial chemists and biochemists, scientists, researchers and academics working in this field. Provides a concise overview of biogas as an energy option Explores biomass resources for production Examines plant design and engineering and process optimisation

Anaerobic Technology in Pulp and Paper Industry - Pratima Bajpai 2017-03-14

This book presents a state-of-the-art report on the treatment of pulp and paper industry effluents using anaerobic technology. It covers a comprehensive range of topics, including the basic reasons for anaerobic treatment, comparison between anaerobic and aerobic treatment, effluent types suitable for anaerobic treatment, design considerations for anaerobic treatment, anaerobic reactor configurations applied for treatment of pulp and paper industry effluents, present status of anaerobic treatment in pulp and paper industry, economic aspects, examples of full scale installations and future trends.

Wastewater Treatment Reactors - Maulin P. Shah 2021-05-12

Wastewater Treatment Reactors: Microbial Community Structure analyzes microbial community structure in relation to changes in physico-chemical parameters, the gene content (metagenome) or gene expression (metatranscriptome) of microbial communities in relation to changes in physico-chemical parameters, physiological aspects of microbial communities, enrichment cultures or pure cultures of key species in relation to changes in physico-chemical parameters, and modeling of potential consequences of changes in microbial community structure or function for higher trophic levels in a given habitat. As several studies have been carried out to understand bulking phenomena and the importance of environmental factors on sludge settling characteristics, which are thought to be strongly influenced by flocculation, sludge bulking, foaming and rising, this book is an ideal resource on the topics covered. Presents the state-of-the-art techniques and applications of omics tools in wastewater treatment reactors (WWTRs) Describes both theoretical and practical knowledge surrounding the fundamental roles of microorganisms in WWTRs Points out the reuse of treated wastewater through emerging technologies Covers the economics of wastewater treatment and the development of suitable alternatives in terms of performance and cost effectiveness Discusses cutting-edge molecular biological tools Gives in-depth knowledge to study microbial community structure and function in

wastewater treatment reactors

Anaerobic Reactors for Sewage Treatment: Design, construction and operation - Carlos Augusto de Lemos Chernicharo 2019-07-15

Anaerobic sewage treatment using UASB reactors has significantly expanded in the last few decades and is now a consolidated technology in some warm climate regions. Several advantages of the anaerobic process make it a more sustainable option for sewage treatment. However, there are still important constraints related to design, construction, and operation of UASB reactors. Conversely, there is enough knowledge, experience, and proven technology that can be used to effectively tackle all the related drawbacks. This book delivers the most relevant techno-scientific developments from academia and water authorities, comprehensively addressing the main aspects of interest in design, construction, and operation of UASB reactors for sewage treatment. Special attention is given to the proper and integrated management of sludge, scum, gaseous emissions, energy recovery, and effluent quality. The main purpose is to provide information and share experiences not yet compiled in the specialized literature on anaerobic sewage treatment. Therefore, a sequence of 12 well-interconnected chapters consolidates the practical knowledge and experiences that important research groups and recognized professionals worldwide have acquired over the past 20 years in demo- and full-scale anaerobic-based sewage treatment plants. Anaerobic Reactors for Sewage Treatment: Design, Construction and Operation can significantly contribute towards a responsible expansion of the anaerobic technology in the world. The book is a valuable tool for engineers, constructors, operators, wastewater utility managers, as well as for students interested in anaerobic processes for sewage treatment.

Biological Treatment of Industrial Wastewater - Maulin P. Shah 2021-12-03

Biological Treatment of Industrial Wastewater presents a comprehensive overview of the latest advances and trends in the use of bioreactors for treating industrial wastewater.

Membrane Biological Reactors - Faisal I. Hai 2013-11-01

In recent years the MBR market has experienced unprecedented growth. The best practice in the field is constantly changing and unique quality requirements and management issues are regularly emerging. Membrane Biological Reactors: Theory, Modeling, Design, Management and Applications to Wastewater Reuse comprehensively covers the salient features and emerging issues associated with the MBR technology. The book provides thorough coverage starting from biological aspects and fundamentals of membranes, via modeling and design concepts, to practitioners' perspective and good application examples. Membrane Biological Reactors focuses on all the relevant emerging issues raised by including the latest research from renowned experts in the field. It is a valuable reference to the academic and professional community and suitable for undergraduate and postgraduate teaching in Environmental Engineering, Chemical Engineering and Biotechnology. Editors: Faisal I. Hai, University of Wollongong, Australia Kazuo Yamamoto, University of Tokyo, Japan Chung-Hak Lee, Seoul National University, Korea.

Biology of Wastewater Treatment - N. F. Gray 2004

This comprehensive text provides the reader with both a detailed reference and a unified course on wastewater treatment. Aimed at scientists and engineers, it deals with the environmental and biological aspects of wastewater treatment and sludge disposal. The book starts by examining the nature of wastewaters and how they are oxidized in the natural environment. An introductory chapter deals with wastewater treatment systems and examines how natural principles have been harnessed by man to treat his own waste in specialist reactors. The role of organisms is considered by looking at kinetics, metabolism and the different types of micro-organisms involved. All the major biological process groups are examined in detail, in highly referenced chapters; they include fixed film reactors, activated sludge, stabilization ponds, anaerobic systems and vegetative processes. Sludge treatment and disposal is examined with particular reference to the environmental problems associated with the various disposal routes. A comprehensive chapter on public health looks at the important waterborne organisms associated with disease, as well as removal processes within treatment systems. Biotechnology has had an

enormous impact on wastewater treatment at every level, and this is explored in terms of resource reuse, biological conversion processes and environmental protection. Finally, there is a short concluding chapter that looks at the sustainability of waste water treatment. The text is fully illustrated and supported by over 3000 references.

Advances in Wastewater Treatment - Giorgio Mannina 2018-10-15

Advances in Wastewater Treatment presents a compendium of the key topics surrounding wastewater treatment, assembled by looking at the future technologies, and provides future perspectives in wastewater treatment and modelling. It covers the fundamentals and innovative wastewater treatment processes (such as membrane bioreactors and granular process). Furthermore, it focuses attention on mathematical modelling aspects in the field of wastewater treatments by highlighting the key role of models in process design, operation and control. Other topics include: • Anaerobic digestion • Biological nutrient removal • Instrumentation, control and automation • Computational fluid dynamics in wastewater • IFAS systems • New frontiers in wastewater treatment • Greenhouse gas emissions from wastewater treatment Each topic is addressed by discussing past, present and future trends. Advances in Wastewater Treatment is a valid support for researchers, practitioners and also students to have a frame of the frontiers in wastewater treatment and modelling.

Current Developments in Biotechnology and Bioengineering - Giorgio Mannina 2022-09-26

Smart Solutions for Wastewater: Road-mapping the Transition to Circular Economy, the latest release in the Current Developments in Biotechnology and Bioengineering presents up-to-date information on research and technological developments of resource recovery in wastewater treatment in terms of carbon, nutrients and energy. The book fulfils the gaps and current challenges that hinder the application of resource recovery facilities in wastewater treatment plants, discusses knowledge gaps, provides future research perspectives, and discusses strategies to solve problems from a circular economy perspective. It is an excellent, interdisciplinary and updated overview of technologies in terms of potential yields, pollutants removal, nutrients recovery and energy production. Covers different aspects of resource recovery technologies and research gaps in wastewater treatment Focuses on different MBR configurations and systems/hybrid systems in treating a large variety of wastewaters Provides state-of-the-art technology developments, including technology, advantages and challenges as well as strategies to overcome limitations Includes technologies for managing sewage sludge in order to foster solutions for recovering in a circular economy context

Current Advances in Anaerobic Digestion Technology - Marcell Nikolausz 2021-03-17

Anaerobic digestion (AD) is one of the oldest biotechnological processes and originally referred to biomass degradation under anoxic conditions in both natural and engineered systems. It has been used for decades to treat various waste streams and to produce methane-rich biogas as an important energy carrier, and it has become a major player in electrical power production. AD is a popular, mature technology, and our knowledge about the influencing process parameters as well as about the diverse microbial communities involved in the process has increased dramatically over the last few decades. To avoid competition with food and feed production, the AD feedstock spectrum has constantly been extended to waste products either rich in recalcitrant lignocellulose or containing inhibitory substances such as ammonia, which requires application of various pre-treatments or specific management of the microbial resources. Extending the definition of AD, it can also convert gases rich in hydrogen and carbon dioxide into methane that can substitute natural gas, which opens new opportunities by a direct link to traditional petrochemistry. Furthermore, AD can be coupled with emerging biotechnological applications, such as microbial electrochemical technologies or the production of medium-chain fatty acids by anaerobic fermentation. Ultimately, because of the wide range of applications, AD is still a very vital field in science. This Special Issue highlights some key topics of this research field.

Selected Water Resources Abstracts - 1991

Biological Wastewater Treatment Processes - Davide Dionisi 2017-02-03

The focus of the book is on how to use mass and heat balances to simulate and design biological wastewater treatment processes. All the main processes for biological wastewater treatment are covered viz. activated sludge processes for carbon and nitrogen removal, anaerobic digestion, sequencing batch reactors, and attached growth processes.

Biorefinery - Juan-Rodrigo Bastidas-Oyanedel 2019-04-15

This book discusses the biorefinery of biomass feedstocks. In-depth chapters highlight the scientific and technical aspects and present a techno-economic analysis of such systems. By using a TEA approach, the authors present feasible pathways for conversion of biomass (both residual biomass, energy crops and algae biomass), showing the different possibilities for the production of biochemical materials, biofuels, and fertilizers. The concepts presented in this book will link companies, investors, and governments by providing a framework that will help reduce pollutants and create a biomass related economy that incorporates the newest developments and technologies in the area.

Basic Principles of Wastewater Treatment - Marcos Von Sperling 2007-03-30

Basic Principles of Wastewater Treatment is the second volume in the series Biological Wastewater Treatment, and focusses on the unit operations and processes associated with biological wastewater treatment. The major topics covered are: microbiology and ecology of wastewater treatment reaction kinetics and reactor hydraulics conversion of organic and inorganic matter sedimentation aeration The theory presented in this volume forms the basis upon which the other books of the series are built. About the series: The series is based on a highly acclaimed set of best selling textbooks. This international version is comprised by six textbooks giving a state-of-the-art presentation of the science and technology of biological wastewater treatment. Other titles in the series are: Volume 1: Wastewater Characteristics, Treatment and Disposal; Volume 3: Waste Stabilisation Ponds; Volume 4: Anaerobic Reactors; Volume 5: Activated Sludge and Aerobic Biofilm Reactors; Volume 6: Sludge Treatment and Disposal

Optimization of the Electron Donor Supply to Sulphate Reducing Bioreactors Treating Inorganic Wastewater - Luis Carlos Reyes-Alvarado 2018-09-03

The main objective of this research was to optimize the electron donor supply in sulphate reducing bioreactors treating sulphate rich wastewater. Two types of electron donor were tested: lactate and slow release electron donors such as carbohydrate based polymers and lignocellulosic biowastes. Biological sulphate reduction was evaluated in different bioreactor configurations: the inverse fluidized bed, sequencing batch and batch reactors. The reactors were tested under steady-state, high-rate and transient-state feeding conditions of electron donor and acceptor, respectively. The results showed that the inverse fluidized bed reactor configuration is robust and resilient to transient and high-rate feeding conditions at a hydraulic retention time as low as 0.125 d. The biological sulphate reduction was limited by the COD:sulphate ratio (82% either using carbohydrate based polymers or lignocellulosic bio-wastes, in batch bioreactors. The biological sulphate reduction was limited by the hydrolysis-fermentation rate and by the complexity of the slow release electron donors.

Anaerobic Reactors - Carlos Augusto de Lemos Chernicharo 2007

Anaerobic Digestion Processes in Industrial Wastewater Treatment - Sandra M. Stronach 2012-12-06

There have been many significant microbiological, biochemical and technological advances made in the understanding and implementation of anaerobic digestion processes with respect to industrial and domestic wastewater treatment. Elucidation of the mechanisms of anaerobic degradation has permitted a greater control over the biological parameters of waste conversion and the technical advances achieved have reduced the time and land area requirements and increased the cost-effectiveness and efficiency of the various processes presently in use. By

product recovery in the form of utilisable methane gas has become increasingly feasible, while the development of new and superior anaerobic reactor designs with increased tolerance to toxic and shock loadings of concentrated effluents has established a potential for treating many extremely recalcitrant industrial wastestreams. The major anaerobic bioreactor systems and their applications and limitations are examined here, together with microbiological and biochemical aspects of anaerobic wastewater treatment processes. London, June 1986 S. M. Stronach T. Rudd J. N. Lester v Table of Contents 1 The Biochemistry of Anaerobic Digestion 1 1. 1 Kinetics of Substrate Utilisation and Bacterial Growth 3 1. 1. 1 COD Fluxes and Mean Carbon Oxidation State 3 1. 1. 2 Bacterial Growth and Biokinetics 4 1. 1. 2. 1 Growth and Single Substrate Kinetics 4 1. 1. 2. 2 Multisubstrate Systems . 8 1. 2 Kinetics and Biochemistry of Hydrolysis 8 1. 3 Kinetics and Biochemistry of Fermentation and J1-Oxidation . 11 1.

Aquaponics Food Production Systems - Simon Goddek 2019-06-21

This open access book, written by world experts in aquaponics and related technologies, provides the authoritative and comprehensive overview of the key aquaculture and hydroponic and other integrated systems, socio-economic and environmental aspects. Aquaponic systems, which combine aquaculture and vegetable food production offer alternative technology solutions for a world that is increasingly under stress through population growth, urbanisation, water shortages, land and soil degradation, environmental pollution, world hunger and climate change.

Waste Stabilisation Ponds - Marcos Von Sperling 2007-03-30

Waste Stabilisation Ponds is the third volume in the series Biological Wastewater Treatment. The major variants of pond systems are fully covered, namely: facultative ponds anaerobic ponds aerated lagoons maturation ponds The book presents in a clear and informative way the main concepts, working principles, expected removal efficiencies, design criteria, design examples, construction aspects, operational guidelines and sludge management for pond systems. About the series: The series is based on a highly acclaimed set of best selling textbooks. This international version is comprised by six textbooks giving a state-of-the-art presentation of the science and technology of biological wastewater treatment. Other titles in the series are: Volume 1: Waste Stabilisation Ponds Volume; 2: Basic Principles of Wastewater Treatment; Volume 4: Anaerobic Reactors; Volume 5: Activated Sludge and Aerobic Biofilm Reactors; Volume 6: Sludge Treatment and Disposal

Current Developments in Biotechnology and Bioengineering - Xuan-Thanh Bui 2022-08-26

Advances in Biological Wastewater Treatment Systems covers different recent advanced technologies, including green technologies, for biological wastewater treatment and wastewater reuse. The technologies involve novel biological processes and/or modified processes coupled with nano materials for improving the performance of the existing treatment processes. The book also describes treatment strategies for the current pollution from complex organic matter, nutrients, toxic substances, micro plastics and emerging micro pollutants in different water resources. The treatment processes describe the recent developed technologies for wastewater treatment and reuse such as biological nutrient removal, bioreactors, photobioreactors, membrane bioreactors, wetlands, algae-bacteria process, natural treatments, integrated/hybrid bio systems, etc. The novel bio systems include aerobic, anaerobic, facultative operation modes with various of types of microorganisms. Provides updated information on biological nutrient removal from wastewater Includes anaerobic and aerobic wastewater treatment processes Provides state-of-art information on design and operation of novel systems, including membrane bioreactors Describes hybrid treatment processes

Anaerobic Sewage Treatment - Jeroen van der Lubbe 2019-08-15

Anaerobic Sewage Treatment: Optimization of Process and Physical Design of Anaerobic and Complementary Processes focuses on process design and deals with start-up procedures and steady state performance of UASB reactors, as well as the influence of operation on reactor performance.

Environmental Anaerobic Technology - Herbert H P Fang 2010-10-07

Anaerobic technology has become widely accepted by the environmental industry as a cost-effective alternative to the conventional aerobic process. In addition, with the intrinsic advantages of energy saving, reduced sludge yield, and production of biofuel, anaerobic process will be the favored green treatment technology for sustainable environment in years to come. Written by 40 renowned experts from 13 countries/regions, this book consists of 18 chapters compiling state-of-the-art information on new developments in various aspects of anaerobic technology. These include development of new types of reactors, uses of molecular techniques for microbial studies and mathematical modeling, productions of bio-hydrogen by fermentation and microbial electrolysis cell, as well as broadening applications to the treatment of municipal wastewater, effluents from chemical industry and agricultural wastes with high lignocellulose content.

Contents: Overview and Outlook: The Route of Anaerobic Waste (Water) Treatment Toward Global Acceptance (G Lettinga) Full-Scale Applications: Developments of New Anaerobic Treatment Technology in France (R Moletta) Applications and New Developments of Biogas Technology in Japan (Y-Y Li & T Kobayashi) Anaerobic Sewage Treatment Using UASB Reactors: Engineering and Operational Aspects (J B Van Lier et al.) Application of UASB Technology for Sewage Treatment with a Novel Post-Treatment Process (S Uemura & H Harada) Emerging Technologies: Anaerobic Granulation and Granular Sludge Reactor Systems (J H Tay et al.) Anaerobic Membrane Reactors (D C Stuckey) The Anaerobic Baffled Reactor (ABR) for Wastewater Treatment (D C Stuckey) Anaerobic Treatment of Phenolic Wastewaters (D Liang & H H P Fang) Application of Molecular Methods for Anaerobic Technology (T Zhang) Application of Mathematical Models to Anaerobic Digestion Process (H Yasui & R Goel) New Developments: Anaerobic Digestion of Lignocellulosic Wastes by Rumen Microorganisms: Chemical and Kinetic Analyses (Z-H Hu et al.) Enzymatic Treatment of Lignocellulosic Wastes for Anaerobic Digestion and Bioenergy Production (G D Saratale et al.) Biohydrogen Production by Fermentation and Microbial Electrolysis Cells (N Q Ren et al.) Research and Development of Biohydrogen Production in Taiwan (C-Y Lin & C-H Lay) A Two-Stage Fermentation Process Converting Waste and Wastewater to Hydrogen and Methane (H-S Shin & D-H Kim) Bio-Productions of Hydrogen and Ethanol from Sugarcane (A Reungsang & P Plangklang) Synthesis Gas Fermentation (S Sung & P-H Lee) Readership: Researchers, practitioners, professionals, postgraduate and graduate students in environmental engineering, environmental biotechnology, environmental management, waste management and pollution control. Keywords: Biofuel; Green Energy; Anaerobic Digestion; Anaerobic Technology; Wastewater Treatment; Bio-Hydrogen

Microbial Electrochemical and Fuel Cells - Keith Scott 2015-11-25

Microbial Electrochemical and Fuel Cells: Fundamentals and Applications contains the most updated information on bio-electrical systems and their ability to drive an electrical current by mimicking bacterial interactions found in nature to produce a small amount of power. One of the most promising features of the microbial fuel cell is its application to generate power from wastewater, and its use in the treatment of water to remove contaminants, making it a very sustainable source of power generation that can feasibly find application in rural areas where providing more conventional sources of power is often difficult. The book explores, in detail, both the technical aspects and applications of this technology, and was written by an international team of experts in the field who provide an introduction to microbial fuel cells that looks at their electrochemical principles and mechanisms, explains the materials that can be used for the various sections of the fuel cells, including cathode and anode materials, and provides key analysis of microbial fuel cell performance looking at their usage in hydrogen production, waste treatment, and sensors, amongst other applications. Includes coverage of the types and principles of electrochemical cells Provides information on the construction of fuel cells and appropriate materials Presents the latest on this renewable source of energy and the process for the treatment of waste water

Biofilms in Wastewater Treatment - Stefan Wuertz 2003-04-30

The central theme of the book is the flow of information from experimental approaches in biofilm

research to simulation and modeling of complex wastewater systems. Probably the greatest challenge in wastewater research lies in using the methods and the results obtained in one scientific discipline to design intelligent experiments in other disciplines, and eventually to improve the knowledge base the practitioner needs to run wastewater treatment plants. The purpose of Biofilms in Wastewater Treatment is to provide engineers with the knowledge needed to apply the new insights gained by researchers. The authors provide an authoritative insight into the function of biofilms on a technical and on a lab-scale, cover some of the exciting new basic microbiological and wastewater engineering research involving molecular biology techniques and microscopy, and discuss recent attempts to predict the development of biofilms. This book is divided into 3 sections: Modeling and Simulation; Architecture, Population Structure and Function; and From Fundamentals to Practical Application, which all start with a scientific question. Individual chapters attempt to answer the question and present different angles of looking at problems. In addition there is an extensive glossary to familiarize the non-expert with unfamiliar terminology used by microbiologists and computational scientists. The colour plate section of this book can be downloaded by clicking here. (PDF Format 1 MB)

Biological Wastewater Treatment - Mogens Henze 2008-09-01

For information on the online course in Biological Wastewater Treatment from UNESCO-IHE, visit: <http://www.iwapublishing.co.uk/books/biological-wastewater-treatment-online-course-principles-modeling-and-design> Over the past twenty years, the knowledge and understanding of wastewater treatment have advanced extensively and moved away from empirically-based approaches to a first principles approach embracing chemistry, microbiology, physical and bioprocess engineering, and mathematics. Many of these advances have matured to the degree that they have been codified into mathematical models for simulation with computers. For a new generation of young scientists and engineers entering the wastewater treatment profession, the quantity, complexity and diversity of these new developments can be overwhelming, particularly in developing countries where access is not readily available to advanced level tertiary education courses in wastewater treatment. Biological Wastewater Treatment addresses this deficiency. It assembles and integrates the postgraduate course material of a dozen or so professors from research groups around the world that have made significant contributions to the advances in wastewater treatment. The book forms part of an internet-based curriculum in biological wastewater treatment which also includes: Summarized lecture handouts of the topics covered in book Filmed lectures by the author professors Tutorial exercises for students self-learning Upon completion of this curriculum the modern approach of modelling and simulation to wastewater treatment plant design and operation, be it activated sludge, biological nitrogen and phosphorus removal, secondary settling tanks or biofilm systems, can be embraced with deeper insight, advanced knowledge and greater confidence.

Activated Sludge and Aerobic Biofilm Reactors - Marcos Von Sperling 2007-03-30

Activated Sludge and Aerobic Biofilm Reactors is the fifth volume in the series Biological Wastewater Treatment. The first part of the book is devoted to the activated sludge process, covering the removal of organic matter, nitrogen and phosphorus. A detailed analysis of the biological reactor (aeration tank) and the final sedimentation tanks is provided. The second part of the book covers aerobic biofilm reactors, especially trickling filters, rotating biological contractors and submerged aerated biofilters. For all the systems, the book presents in a clear and informative way the main concepts, working principles, expected removal efficiencies, design criteria, design examples, construction aspects and operational guidelines. About the series: The series is based on a highly acclaimed set of best selling textbooks. This international version is comprised by six textbooks giving a state-of-the-art presentation of the science and technology of biological wastewater treatment. Other titles in the series are: Volume 1: Waste Stabilisation Ponds; Volume 2: Basic Principles of Wastewater Treatment; Volume 3: Waste Stabilization Ponds; Volume 4: Anaerobic Reactors; Volume 6: Sludge Treatment and Disposal

Biological Wastewater Treatment - C. P. Leslie Grady Jr. 2011-05-09

Following in the footsteps of previous highly successful and useful editions, *Biological Wastewater Treatment*, Third Edition presents the theoretical principles and design procedures for biochemical operations used in wastewater treatment processes. It reflects important changes and advancements in the field, such as a revised treatment of the micr

Treatment Wetlands - Gabriela Dotro 2017-11-15

Contents: Overview of Treatment Wetlands; Fundamentals of Treatment Wetlands; Horizontal Flow Wetlands; Vertical Flow Wetlands; French Vertical Flow Wetlands; Intensified and Modified Wetlands; Free Water Surface Wetlands; Other Applications; Additional Aspects.

Fundamentals of Biological Wastewater Treatment - Udo Wiesmann 2007-02-27

This concise introduction to the fundamentals of biological treatment of wastewater describes how to model and integrate biological steps into industrial processes. The book first covers the chemical, physical and biological basics, including wastewater characteristics, microbial metabolism, determining stoichiometric equations for catabolism and anabolism, measurements of mass transfer and respiration rates and the aerobic treatment of wastewater loaded with dissolved organics. It then moves on to deal with such applications and technologies as nitrogen and phosphorus removal, membrane technology, the assessment and selection of aeration systems, simple models for biofilm reactors and the modeling of activated sludge processes. A final section looks at the processing of water and the treatment of wastewater integrated into the production process. Essential reading for chemists, engineers, microbiologists, environmental officers, agencies and consultants, in both academia and industry.

Advances in Bioenergy - 2020-05-19

Advances in Bioenergy, Volume Five, part of a new series that provides both principles and recent developments in various kinds of bioenergy technologies, includes the latest on feedstock development, conversion technologies, energy and economics and environmental analysis. This series uniquely provides the fundamentals of these technologies, along with reviews that will be invaluable for students. Chapters in this new release cover Medium Chain Fatty Acids Production by Microbial Chain Elongation: Recent Advances, Two-stage AD for bioenergy and biochemical production from industrial and agricultural wastewater, and more. Written and edited by a world-leading scientist in the area of bioenergy and bioproducts Includes both principles and recent developments within bioenergy technologies Covers the fundamentals of technologies and recent reviews

Sludge Treatment and Disposal - Cleveron Vitorio Andreoli 2007-03-30

Sludge Treatment and Disposal is the sixth volume in the series *Biological Wastewater Treatment*. The book covers in a clear and informative way the sludge characteristics, production, treatment (thickening, dewatering, stabilisation, pathogens removal) and disposal (land application for agricultural purposes, sanitary landfills, landfarming and other methods). Environmental and public health issues are also fully described. About the series: The series is based on a highly acclaimed set of best selling textbooks. This international version is comprised by six textbooks giving a state-of-the-art presentation of the science and technology of biological wastewater treatment. Other titles in the series are: Volume 1: Waste Stabilisation Ponds; Volume 2: Basic Principles of Wastewater Treatment; Volume 3: Waste Stabilization Ponds; Volume 4: Anaerobic Reactors; Volume 5: Activated Sludge and Aerobic Biofilm Reactors