Biological Denitrification Of High Nitrate Wastewaters A

Biological Wastewater Treatment: Principles, Model
This manual is constructed to progress from a broad discussion of nitrogen in the environment to the concepts using biological processes to control or remove nitrogen, and finally to the details of designing specific systems.
Nitrogen in the Marine Environment provides information pertinent to the many aspects of the nitrogen cycle. This book presents the advances in ocean productivity research, with emphasis on the role of microbes in nitrogen transformations with excursions to higher trophic levels. Organized into 24 chapters, this book begins with an overview of the abundance and distribution of the various forms of nitrogen in a number of estuaries. This text then provides a comparison of the nitrogen cycling of various ecosystems within the marine environment. Other chapters consider chemical distributions and methodology as an aid to those entering the field. This book discusses as well the enzymology of the initial steps of inorganic nitrogen assimilation. The final chapter deals with the philosophy and application of modeling as an investigative method in basic research on nitrogen dynamics in coastal and open-ocean marine environments. This book is a valuable resource for plant biochemists, microbiologists, aquatic ecologists, and bacteriologists.
Bioinformatics and Biomedical Engineering: New Advances
Proceedings of the Conference on Nitrogen as a Water Pollutant
Ecology, Biotechnological Applications and Environmental Impacts
Recent Progress in Slow Sand and Alternative Biofiltration Processes
Selected Water Resources Abstracts

Slow sand filtration is typically cited as being the first "engineered" process in drinking-water treatment. Proven modifications to the conventional slow sand filtration process, the awareness of induced biological activity in riverbank filtration systems, and the growth of oxidant-induced biological removals in more rapid-rate filters (e.g. biological activated carbon) demonstrate the renaissance of biofiltration as a treatment process that remains viable for both small, rural communities and major cities. Biofiltration is expected to become even more common in the future as efforts intensify to decrease the presence of disease-causing microorganisms and disinfection by-products in drinking water, to minimize microbial regrowth potential in distribution systems, and where operator skill levels are emphasized. Recent Progress in Slow Sand and Alternative Biofiltration Processes provides a state-of-the-art assessment on a variety of biofiltration systems from studies conducted around the world. The authors collectively represent a perspective from 23 countries and include academics, biofiltration system users, designers, and manufacturers. It provides an up-to-date perspective on the physical, chemical, biological, and operational factors affecting the performance of slow sand filtration (SSF), riverbank filtration (RBF), soil-aquifer treatment (SAT), and biological activated carbon (BAC) processes. The main themes are: comparable overviews of biofiltration systems; slow sand filtration process behavior, treatment performance and process developments; and alternative biofiltration process behaviors, treatment performances, and process developments.
Several health problems may be caused by excess nitrate in drinking water, the most important of which being methemoglobinemia, a potentially fatal disorder, in infants under six months of age. Many different parts of the world have been facing the problem of nitrate contaminated surface and groundwaters due in large part to excessive use of nitrate-based chemical fertilizers. In the Region of Waterloo, Ontario, Canada some groundwater sources have nitrate concentrations approaching the Health Canada and Ontario Ministry of the Environment maximum acceptable concentration (MAC) of 10 mg NO3--N/L. Finding a practical and economical way to reduce nitrate concentrations in representative groundwater in the Region of Waterloo was the overall objective of this research. To achieve this goal, nitrate removal technologies including biological denitrification, ion exchange (IX), reverse osmosis (RO), electrodialysis (ED), and chemical denitrification were reviewed and compared. IX and RO were found to be the most promising technologies for nitrate removal. They have also been approved by the United States Environmental Protection Agency (USEPA) as Best Available Technologies (BAT). To investigate the feasibility of IX and RO for nitrate removal from representative groundwater in the Region of Waterloo, bench-scale experiments were conducted and compared. These technologies could be considered for application at full- or point-of-use (POU)-scale. Decision support assistance for the selection of the appropriate technology for different technical and economical conditions is provided as an outcome of this work. Two nitrate-selective ion exchange resins (Dowex NSR-1 and Purolite® A-520E), two non-selective resins (Purolite® A-300E and Amberlite® IRA400 Cl), and a commercially-available RO POU device (Culligan® Aqua-Cleer® model RO30), which included a particle filter and a carbon block, were tested with deionized water and real groundwater.* IX results confirmed that production time before resin exhaustion was influenced by operating conditions, specifically bed depth as would be expected. It was also confirmed that the presence of competing anions (sulfate, chloride) and alkalinity adversely affected performance, with sulfate being the main competitor for nitrate removal. The extent of these effects was quantified for the conditions tested. At the end of the runs, the non-selective resins were prone to potential nitrate displacement and release into product water and are therefore not recommended. The nitrate-selective resins did not release previously adsorbed nitrate as their capacity became exhausted. Purolite® A-520E was identified as the best alternative amongst the four resins for removing nitrate from the representative groundwater source. The RO unit removed roughly 80% of the nitrate from groundwater. Background ions didn't appear to compete with each other for removal by RO units, so RO might be a more appropriate technology than IX for nitrate removal from waters with high concentrations of sulfate or TDS. Since RO removes other background ions as well as nitrate, the product water of RO is low in alkalinity and can potentially be corrosive, if water from a small full-scale system is pumped through a communal distribution system. Post-treatment including pH adjustment, addition of caustic soda, and/or corrosion inhibitors may be required. While the carbon block did not play a substantial role with respect to removal of nitrate in the groundwater tested, a potential issue was identified when running RO systems without the carbon block. In deionized water (and presumably in very low alkalinity real waters) it was noted that RO nitrate removal efficiency dropped substantially as the alkalinity of the influent water approached zero. With respect to the scale of application of IX and RO devices, IX can be applied at full-scale without requiring large amounts of space. However, if feed water contains high concentrations of sulfate or TDS, nitrate leakage happens sooner and regeneration would be needed at more frequent intervals. Also, chloride concentrations in IX product water might exceed aesthetic objectives (AO) and should be monitored in cases of high feed water TDS. POU IX devices are not recommended when feed water nitrate concentration is high due to potential nitrate leakage into the product water when the resin is nearing exhaustion which increases public health risk. Issues associated with RO application at full-scale are high energy demand, low recovery, high costs, need of pre-treatment (fouling control), and post-treatment (corrosion control). On the other hand, POU RO devices may be acceptable since low recovery is of less importance in a household system, and product water corrosivity is less relevant. POU RO devices are preferable to POU IX units due to their lower risk of nitrate leakage into treated water. * Mention of trade names or commercial products does not constitute endorsement or recommendation for use.
This book examines bioremediation technologies as a tool for environmental protection and management. It provides global perspectives on recent advances in the bioremediation of various environmental pollutants. Topics covered include comparative analysis of bio-gas electrification from anaerobic digesters, mathematical modeling in bioremediation, the evaluation of next-generation sequencing technologies for environmental monitoring in wastewater abatement; and the impact of diverse wastewater remediation techniques such as the use of nanofibers, microbes and genetically modified organisms; bioelectrochemical treatment; phytoremediation; and biosorption strategies. The book is targeted at scientists and researchers working in the field of bioremediation.
Field Demonstration of Biological Denitrification of Polluted Groundwater and Pilot Scale Field Testing of Biological Denitrification with Widely Varied Hydraulic Loading Rates
Select Proceedings of ICACE 2015
Comparison of acetate and methanol as carbon sources for the biological denitrification of high nitrate wastewaters
Nitrates in Groundwater
Biological Denitrification of Polluted Groundwater

Biological denitrification of nitrate solutions at concentrations of greater than one kilogram nitrate per cubic meter is accomplished anaerobically in an upflow column having as a packing material a support for denitrifying bacteria.

Environmental Technologies to Treat Nitrogen Pollution will provide a thorough understanding of the principles and applications of environmental technologies to treat nitrogen contamination. The main focus will be on water and wastewater treatment, with additional coverage of leachates and off-gasses. The book will bring together an up-to-date compilation of the main physical, chemical and biological processes demanded for the removal of nitrogenous contaminants from water, wastewater, leachates and off-gasses. It will include a s chapters providing a deep and broad knowledge of the principles and applications required for the treatment of nitrogen pollution. Each chapter will be prepared by recognized specialists across the range of different aspects involved in the removal of nitrogenous contaminants from industrial discharges. Environmental Technologies to Treat Nitrogen Pollution will be the first book to provide a complete review of all the different processes used for the global management of nitrogen pollution. It will also contain updated information about strategies to achieve nitrogen recovery and reuse in different industrial sectors. Several case studies will document the application of different environmental technologies to manage nitrogen pollution. This book will be of interest to lecturers and graduate students in the following subject areas: environmental engineering, environmental biotechnology, wastewater treatment plant design, water pollution control, contaminants recovery and reuse. The book will also be an attractive reference for environmental engineering consultants.

The 9th International Conference on Bioinformatics and Biomedical Engineering (iCBBE 2015) was held on September 18-20, 2015, Shanghai, China. This proceedings volume assembles papers from various professionals engaged in the fields of Biomedical Engineering, Bioinformatics and Computational Biology. The conference had special sessio

Combined Ion Exchange
Proceedings of the 48th Industrial Waste Conference Purdue University, May 1993
Biological Wastewater Treatment
Biological Fluidised Bed Treatment of Water and Wastewater
Task 1. Biodenitrification of Low Nitrate Solar Pond Waters Using Sequencing Batch Reactors. Task 2. Solidification/stabilization of High Strength and Biodenitrified Heavy Metal Sludges with a Portland Cement/flyash System

Biological denitrification appears to be one of the most effective methods to remove nitrates from wastewater streams (Christenson and Harremoes, 1975). However, most of the research and development work has been centered on removal of nitrates from sewage or agricultural drainage waters, nitrate nitrogen concentration usually less than 50 g/m/sup 3/. Work was initiated at Oak Ridge National Laboratory (ORNL) in 1974 to test the use of biological nitrification in the removal of high concentrations of nitrate (in excess of 1.0 kg NO/sub 3/-N/m/sup 3/) from uranium purification waste streams. Since then, a full-scale treatment facility, a stirred reactor, has been installed at the Y-12 plant; and a pilot-plant, using a fluidized bed, has been proposed at Portsmouth Gaseous Diffusion Plant. The objective of this manuscript is to present some applied microbiological research relating to possible constraints in biologically denitrifying certain waste streams in the nuclear industry and comparing the effectiveness of denitrification of these waste streams in three bench scale reactors, (1) a continuous flow-stirred reactor, (2) stirred bed rector, and (3) a fluidized bed reactor.
This book highlights the impacts of emerging pollutants (both organic and inorganic) in water bodies and the role and performances of different water and wastewater treatment approaches that are presently being employed in the field of environmental engineering. Some of these approaches are focused on 'end-of-pipe' treatment, while most of these approaches are focused on the application of novel physic-chemical and biological techniques for wastewater treatment and reuse. The goal of this book is to present the emerging technologies and trends in the field of water and wastewater treatment. The papers in this book provide clear proof that environmentally friendly (bio)technologies are becoming more and more important and playing a critical role in removing a wide variety of organic and inorganic pollutants from water. In Focus – a book series that showcases the latest accomplishments in water research. Each book focuses on a specialist area with papers from top experts in the field. It aims to be a vehicle for in-depth understanding and inspire further conversations in the sector.
Eleven industrial carbon sources were evaluated for their efficiency to supply energy for biological denitrification of high nitrates (1259 mg/liter) in a single-stage continuous flow fermenter. The determination of relative efficiency was the minimum C/N ratio (grams of carbon to grams of nitrogen) necessary to achieve at least 95 percent denitrification and 90 percent total organic carbon (TOC) removal. Methanol was the most efficient carbon source evaluated, while sweet whey, corn steep liquor, acid whey and soluble potato solids followed in order of decreasing efficiency. Three of the carbon sources failed to achieve the 90 percent reduction in TOC. Sewage sludge was unusable due to lack of available carbon. This order of efficiency may change once other factors are considered such as cost of carbon source, transportation costs, handling costs, availability, and other factors. In the treatment of nitrate contaminated munitions process waters the use of alternate carbon sources will be needed not only for biological nitrate reduction but also for the biological cometabolism of many of the munition compounds themselves.
Biotechnology for Waste Management and Site Restoration
Principles, Modelling and Design
Denitrification-Efficiencies of Alternate Carbon Sources
Biological Denitrification of High Concentration Nitrate Waste
Selected Irrigation Return Flow Quality Abstracts

Nitrogen containing compounds produced by industrial processes are pollutants which pose a significant environmental and health hazard. There are a number of processes that have been devised for removing nitrogen compounds from wastewater. This reference book summarizes different denitrification methods for wastewater processing. The book introduces readers to toxic nitrogen compounds responsible for water pollution. This introduction is followed by chapters which explain different nitrogen removal methods including conventional methods, biological methods, food industry wastewater treatment and new approaches towards environmental pollution remediation: Bio Electrochemical Systems (BESs). This book is a handy reference guide for industrial and environmental engineers and students learning about wastewater management and industrial denitrification.
This edited volume comprises the proceedings of ICACE-2015. In the recent past Chemical Engineering as a discipline has been diversifying into several frontier areas and this volume addresses the advances in core Chemical Engineering as well as allied fields. The contents of this volume focus on energy and environmental applications of chemical engineering research and on materials science aspects of chemical engineering. This book will be useful to researchers, students, and professionals, particularly those working on interdisciplinary applications of Chemical Engineering problems.
This time-saving book provides extensive coverage of all important aspects of nitrates in groundwater, ranging from prevention to problem assessment to remediation. It begins by highlighting the nitrogen cycle and related health concerns, providing both background information and a unique perspective on health issues. It then analyzes subsurface pr
Water Resources of Arid Areas
Urban Groundwater Management and Sustainability
Environmental Technologies to Treat Nitrogen Pollution
Nitrification and Denitrification
Nitrogen Removal Processes for Wastewater Treatment
Proceedings of the Conference on Nitrogen as a Water Pollutant

The nitrate content of drinking water is rising at an alarming rate in several regions of NATO countries and elsewhere in the world. The increase is due to lack of proper sewage treatment, and primarily to excess fertilizer application. Also, eutrophication in several coastal areas is triggered by high nitrate concentrations. The main purpose of this book is to integrate scientific knowledge related to exposure assessment, health consequences and control of nitrate contamination in water. The motivation is related to the magnitude, the possible adverse health effects, and the high cost of control ling nitrate contamination. Future research tasks are defined by an interaction among hydro logists, toxicologists and environmental engineers in an integrated framework for nitrate risk management. The target readership of this book is a mix of university colleagues, practitioners from both the private and public sectors and advanced graduate students working with the hydrological, health science or environmental engineering aspects of nitrate contamination. The main conclusions include: 1. For risk assessment purposes, knowledge and sufficiently accurate models are available to predict nitrate load and its fate in water under changes in land use. 2. Once agricultural exposure controls are implemented, the response times in ground water may be so long as to make controls unrealistic. 3. It is still unknown whether agricultural best management practice is a compromise between nitrate risk reduction and agricultural revenue. 4. The current drinking water guidelines of 10 mg/L NOrN need not be changed.

Process wastewater and sludges were accumulated on site in solar evaporation ponds during operations at the Department of Energy's Rocky Flats Plant (DOE/RF). Because of the extensive use of nitric acid in the processing of actinide metals, the process wastewater has high concentrations of nitrate. Solar pond waters at DOE/RF contain 300-60,000 mg NO3—/L. Additionally, the pond waters contain varying concentrations of many other aqueous constituents, including heavy metals, alkali salts, carbonates, and low level radioactivity. Solids, both from chemical precipitation and soil material deposition, are also present. Options for ultimate disposal of the pond waters are currently being evaluated and include stabilization and solidification (S/S) by cementation. Removal of nitrates can enhance a wastes amenability to S/S, or can be a unit operation in another treatment scheme. Nitrate removal is also a concern for other sources of pollution at DOE/RF, including contaminated groundwater collected by interceptor trench systems. Finally, nitrate pollution is a problem at many other DOE facilities where actinide metals were processed. The primary objective of this investigation was to optimize biological denitrification of solar pond waters with nitrate concentrations of 300--2,100 mg NO3—/L to below the drinking water standard of 45 mg NO3—/L (10 mg N/L). The effect of pH upon process stability and denitrification rate was determined. In addition, the effect Cr(VI) on denitrification and fate of Cr(VI) in the presence of denitrifying bacteria was evaluated.

Optimization of Biological Denitrification Reactors in Treating High Strength Nitrate Wastewater
Carbon Nanomaterials in Biomedicine and the Environment
EPA 440/1
Technological, Educational, Business, Political Aspects
Biological Denitrification of High Nitrate Industrial Streams

Carbon nanomaterials possess special physical and chemical properties. As adsorbents, they are widely used for the purification of water and other liquids, recovery of valuable substances from liquid and gaseous media, and oil refining and also in petrochemical, wine, oil and fat, and other industries. They can be used in medicine, both for the creation of hemosorption systems that are capable of performing specific purification of blood and other physiological fluids, including removal of various exo- and endotoxicants, and for the construction of highly effective adsorbed probiotics. The creation of nanostructured carbon-containing materials is one of many rapidly developing research fields and also the theme of this book. The book focuses on the recent developments in the synthesis of nanostructured carbon multifunctional sorbents and covers topics such as fusicoccin compounds as anticancer agents, entero- and vulnerosorption, and blood purification. It will be useful for scientists, chemical industry specialists, professors, and master's and PhD students of chemical, physical, and biological sciences.
Nitrate contamination in groundwater resources poses a serious threat, not only to the health of those who would drink it, but also as a potential nutrient for eutrophication. Current methods of nitrate removal can efficiently remove nitrate below 10 mg/L as nitrogen, but may require resources unavailable to small community water systems (SCWS). Sulfur-oxidizing biological denitrification is a promising alternative that may be more suitable for SCWS. Sulfur-oxidizing denitrification has previously been shown to have a high nitrate removal efficiency; however, it produces water high in sulfate. Utilization of sulfide-bearing minerals, rather than elemental sulfur as an electron donor, may yield similar nitrate removal efficiencies without the production of unwanted byproducts.
With Africa's water resources constantly threatened by an increasing population and the resultant rise in water demand, together with the stresses of water use for various activities, desertification, climate change, and other interventions in the water cycle by man, it is vital that the water resources in arid and semi-arid regions are developed a
Biological Denitrification of High Nitrate Ground Water
Acta Microbiologica Polonica
Bioremediation: Applications for Environmental Protection and Management
Proceedings of the International Conference on Water Resources of Arid and Semi-Arid Regions of Africa, Gaborone, Botswana, 3-6 August 2004
Continuous Biological Denitrification of Wastewater

Nitrate levels in Central Australian ground water; samples from Ti Tree and Yulara; water treatment and appropriate technology.

Anthropogenic activity has clearly altered the N cycle contributing (among other factors) to climate change. This book aims to provide new biotechnological approach representing innovative strategies to solve specific problems related to the imbalance originating in the N cycle. Aspects such as new conceptions in agriculture, wastewater treatment, and greenhouse gas emissions are discussed in this book with a multidisciplinary vision. A team of international authors with wide experience have contributed up-to-date reviews, highlighting scientific principles and their environmental importance and integrating different biotechnological processes in environmental technology.

Nitrification and denitrification are essential processes for aquatic ecological system and vital for human health. While ammonia is applied for disinfection together with chlorine to produce chloramine, excessive ammonia may cause nitrification and bacteria growth in water transmission pipeline. Since excessive discharge may cause eutrophication and deterioration of aquatic system, nitrate is regulated for wastewater discharge in sensitive areas. Further, nitrate needs to be monitored and controlled in drinking water treatment to protect against methemoglobinemia in bottle-fed infants.

Assessing Innovative Technologies for Nitrate Removal from Drinking Water
Nitrogen Cycle
Exposure, Consequence, and Control
Materials, Energy and Environment Engineering
Environmentally Friendly (Bio)Technologies for the Removal of Emerging Organic and Inorganic Pollutants from Water

YNO and[small letter mu][subscriptmax]NO of the sample and synthetic nitrate solution are obtained from the absorbance and NO3N measurements. The biotreatability index, BI, of the test sample is obtained by taking the ratio of[small letter mu][subscript max]NO of the sample to [small letter mu][subscript max]NO of a synthetic nitrate solution containing the same nitrate concentration. A BI value of 1 means that the test sample can be successfully denitrified, and values considerably less than 1 show that the denitrification will be very difficult.
Biotechnology for Waste Management and Site Restoration covers: waste management - solid, gaseous, liquid; site restoration - radioactivity, organics, toxic metals; educational, economic, social and business aspects; and international collaboration. International collaboration is growing apace and many concrete projects have been started. The body of knowledge is growing. Over the long term, it is envisaged that this international collaboration will result in a long-term scientific and technological strategy, new technologies and alternative solutions, and practical implementations of biotechnology for the nuclear and industrial sectors of the economy.
Known and used throughout the world, the Purdue Industrial Waste Conference Proceedings books are the most highly regarded in the waste treatment field. New research, case histories, and operating data cover every conceivable facet of today's big problems in environmental control, treatment, regulation, and compliance. This volume representing the proceedings from the 48th conference provides unparalled information and data for your current waste problems.
Nitrogen Control
EPA 600/2
Nitrate Contamination
Biological Denitrification of High-nitrates Wastes Generated in the Nuclear Industry
Chemolithotrophic Denitrification of Nitrate Contaminated Groundwater Using Sulfur-bearing Minerals

The forty papers in this book explore the state of sustainable groundwater management in a wide range of countries and cultures, climates, and geologies. They are organized in topic areas covering flow, chemical water quality, biological water quality, remediation, engineering, and socio-economics. An introductory section presents a range of integrated regional-scale studies. This volume will interest groundwater specialists in industry and research, and will provide insight for other urban specialists, including planners.

Volume 8.4
Nitrogen in the Marine Environment
Proceedings of the 9th International Conference on Bioinformatics and Biomedical Engineering (iCBBE 2015), Shanghai, China, 18-20 September 2015