Biological Denitrification Of High Nitrate Wastewaters A

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

Biological Denitrification of High Nitrate Industrial Streams

Proceedings of the Conference on Nitrogen as a Water Pollutant

Nitrogen in the Marine Environment

Aerobic Granular Sludge

Selected Irrigation Return Flow Quality Abstracts 1968-1969

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. 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.

Proceedings of the Conference on Nitrogen as a Water Pollutant

Biological Denitrification of High Nitrate Ground Water

ERDA Energy Research Abstracts

Materials, Energy and Environment Engineering

Volume 8.4
Biology of the Nitrogen Cycle
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
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. 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
Technological, Educational, Business, Political Aspects
Identification and Selection of Environmental Technologies for Use in Central and Eastern Europe
Comparison of acetate and methanol as carbon sources for the biological denitrification of high nitrate wastewaters
Denitrification-

Efficiencies of Alternate Carbon Sources Nitrification and Denitrification

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.*

Supplying crops with adequate nitrogen is vital to ensuring food supplies. Once nitrogen is added to the soil, it is subject to chemical transformations of the nitrogen-cycle including transformation to nitrate.

Excessive amounts of accumulated nitrate may then leach out of the soil and could potentially enter and contaminate drinking water supplies. The purpose of this book is to examine the subject of nitrogen management and ground water protection. The issue of maintaining ground water quality is addressed primarily from an agronomic point of view. Topics covered include: health and economic aspects of nitrate in drinking water; nitrate sources; ground water nitrate in the USA and other developed countries; transport, leaching and accounting for nitrogen; soil, nitrogen, crop and water management; and nitrate in aquifer systems. The book contains a keyword index and is organized into thirteen chapters, each with appropriate references, tables and figures. Chapter authors are among the leading experts

on the subject of nitrate and ground water quality. Readers to whom the book is directed include soil scientists and agronomists, agricultural engineers (irrigation and drainage), environmental scientists, agricultural policy makers, and hydrologists.
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.
Optimization of Biological Denitrification Reactors in Treating High Strength Nitrate Wastewater
Environmentally Friendly (Bio)Technologies for the Removal of Emerging Organic and Inorganic Pollutants from Water
Nitrogen Control
Desalination
Biological Denitrification of High Concentration Nitrate Waste

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. 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.

Aerobic Granular Sludge has recently received growing attention by researchers and technology developers, worldwide. Laboratory studies and preliminary field tests led to the conclusion that granular activated sludge can be readily established and profitably used in activated sludge plants, provided 'correct' process conditions are chosen. But what makes process conditions 'correct'? And what makes granules different from activated sludge flocs? Answers to these question are offered in Aerobic Granular Sludge. Major topics covered in this book include: Reasons and mechanism of aerobic

granule formation Structure of the microbial population of aerobic granules Role, composition and physical properties of EPS Diffuse limitation and microbial activity within granules Physio-chemical characteristics Operation and application of granule reactors Scale-up aspects of granular sludge reactors, and case studies Aerobic Granular Sludge provides up-to-date information about a rapidly emerging new technology of biological treatment.

Scientific and Technical Aerospace Reports

Acta Microbiologica Polonica

Select Proceedings of ICACE 2015

Study on Heterotrophic-Autotrophic Denitrification Permeable Reactive Barriers (HAD PRBs) for In Situ

Groundwater Remediation
Proceedings of the 48th Industrial Waste Conference Purdue University, May 1993
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.

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.

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.

EPA 440/1

Water Resources of Arid Areas

Recent Progress in Slow Sand and Alternative Biofiltration Processes

Assessing Innovative Technologies for Nitrate

Removal from Drinking Water

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.

"Study on Heterotrophic-Autotrophic Denitrification Permeable Reactive Barriers (HAD PRBs) for In Situ Groundwater Remediation" is an unmatched reference work on PRBs for groundwater in situ remediation. It proposes a novel HAD PRB approach for nitrate-contaminated groundwater remediation, and

provides a systematic and clear explanation of design concepts and denitrification mechanisms. The book consists of four chapters, each of which covers key aspects of HAD PRBs. It provides rich, easy-to-follow illustrations, tables and references. Unique as a comprehensive reference work on the subject, it will serve as a valuable resource for all engineers and scientists active in environmental science and engineering, groundwater science, engineering and molecular biology. Prof. Fei Liu works at China University of Geosciences (Beijing), China. Dr. Guoxin Huang works at Beijing Academy of Food Sciences,

China. Both Prof. Howard Fallowfield and Prof. Huade Guan work at Flinders University, Australia. Assistant Engineer Lingling Zhu works at Geological Publishing House, China. Assistant Engineer Hongyan Hu works at Hydrogeology and Engineering Geology Prospecting Institute of Heilongjiang Province, China.

A NATO Advanced Research Workshop (ARW) was conducted on June 21-23, 1994 in Visegnid, Hungary related to the clean-up of former Soviet military installation sites. This ARW included a technical site visit to the Komarom Base Site which is a former Soviet military installation in Hungary.

During this three-day ARW, a strategy and set of recommendations were developed for selecting technologies and evaluating remediation as the economic and approaches for these sites. This strategy incorporated such critical issues financial conditions of the region, temporal considerations with regard to the urgency for which remedial actions are needed for these sites, the prioritization of resource allocations for site clean-up using risk-based considerations, and other crucial issues which will affect the implementation of remedial activities in the region. Approximately 40 invited experts, representing a number of different

disciplines as well as both NATO and Cooperation Partner countries from the region, participated in this ARW. The types of former Soviet military installations in Central and Eastern Europe include: aircraft bases, fueling areas, maintenance and repair facilities, training grounds, non ammunition storage areas (for lubricants, chemicals, paints, equipment), ammunition storage areas, medical facilities, production facilities, and municipal facilities. Environmental contamination at these sites poses significant human health and environmental risks. Site contaminants include: solvents (e. g. , BTEX), mineral oil hydrocarbons,

polycyclic aromatic hydrocarbons (PAHs), chlorinated hydrocarbons, heavy metals, pesticides residues, and polychlorinated biphenyls (PCBs). The primary environmental media adversely affected by these contaminants are soils, ground water and surface water.

Nitrogen Removal Processes for Wastewater Treatment

Nitrates in Groundwater

First Annual Issue

Selected Water Resources Abstracts

Urban Groundwater Management and Sustainability

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.

Biological Denitrification of High Nitrate Ground Water

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.

Proceedings of the International Conference on Water Resources of Arid and Semi-Arid Regions of Africa, Gaborone, Botswana, 3-6 August 2004

Radioactive Waste Processing and Disposal

Biological Fluidised Bed Treatment of Water and Wastewater
Nitrogen Management and Ground Water Protection
Biological Denitrification of Polluted Groundwater
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.
Biological Denitrification of High-nitrates Wastes Generated in the Nuclear Industry
Bioremediation: Applications for Environmental Protection and Management
Clean-up of Former Soviet

Military Installations Combined Ion Exchange Biotechnology for Waste Management and Site Restoration