Phosphorus And Nitrogen Removal From Municipal Wastewater

Phosphorus: Pollutant and Resource of the Future

Biological Removal of Phosphorus and Nitrogen from Wastewater

Analysis of Nitrogen and Phosphorus Removal from a Best Management Practice

The Role of Protozoa in the Removal of Phosphorus and Nitrogen in Activated Sludge Systems

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This valuable new book offers practical guidance regarding the design and operation of systems for reducing effluent nitrogen and phosphorus. The principles of nitrogen and phosphorus removal are discussed, including sources of nitrogen and phosphorus in wastewater, removal options, nitrogen and phosphorus transformations in treatment, process selection, and treatment. The book also covers the design and operation of nitrogen and phosphorus removal systems, including system options, system design, facility design, facilities, costs, and operation. Practical case studies are provided as examples of successful system implementations that may be able to help you decide what will work best in your plant.

Characterizing Mechanisms of Simultaneous Biological Nutrient Removal During Wastewater Treatment

National Policies and Technologies for Phosphorus and Nitrogen Removal from Municipal Wastewater in Finland

An Operator's Guide to Biological Nutrient Removal (BNR) in the Activated Sludge Process

Research Needs for Nutrient Removal from Wastewater

Nitrogen and Phosphorus Reactions in Overland Flow of Wastewater

Simultaneous biological nutrient removal (SBNR) is the removal of nitrogen and/or phosphorus in excess of that required for biomass synthesis in biological wastewater treatment systems where there are no defined anaerobic and/or anoxic zones. The hypothesis is that one or more of three mechanisms is responsible within individual systems: variations in the bioreactor macromenvironment created by the mixing pattern, gradients within the floc microenvironment, and/or novel microorganism activity. Understanding of the mechanisms of SBNR can be expected to lead to improved efficiency and reliability in its application. Preliminary work documented SBNR in 7 full-scale Orbal® TM closed loop bioreactors. A batch assay demonstrated that novel microorganism activity was of little importance in SBNR at the three plants tested. While the floc microenvironment likely plays an important role in nitrogen removal in such plants, it cannot explain phosphorus removal. A computational fluid dynamics (CFD) model was developed to elucidate the role of the bioreactor macromenvironment in SBNR. This is the first reported application of CFD to activated sludge biological wastewater treatment. Although the software and computational requirements limited model complexity, it still simulated the creation of dissolved oxygen gradients within the system, demonstrating that the anaerobic zones required for SBNR could occur.

Nutrient Removal, WEF MOP 34

Wastewater purification treatment; Nutrient removal; Wetlands; Residuals management; Mathematical modelling.

Nitrogen and Phosphorus Removal from a Secondary Sewage Treatment Effluent

Increasing awareness on the limited nature of the raw materials for the production of inorganic fertilizer is pushing for a shift from removal to recovery of nutrients from waste streams. In municipal wastewater treatment plants the digested sludge liquor, centrate, is a small but nutrient-rich stream that can be treated separately as an efficient way to reduce the nutrient load to the main line. This thesis explores the implications of placing partial nitrification-anammox (PNA) at the core of nutrient removal and recovery in side stream. The results of the study showed that PNA as pretreatment before struvite precipitation allow for the formation of potassium struvite, a mineral that can be returned to fields as fertilizer, and also serves as an efficient CO₂ stripper, implying reduced need for alkali addition. It also demonstrated the feasibility of PNA granules to biologically induce the formation of phosphate-rich hydroxyapatite of high purity.

Biological Phosphorus and Nitrogen Removal in a Single Sludge System

Biological phosphorus (bio-P) removal has become a reliable and well-understood process within wastewater treatment, despite being one of the
Nitrogen Control and Phosphorus Removal in Sewage Treatment

Phosphorus and Nitrogen Removal Efficiencies of Infiltration Trenches

Animal Manure

Excessive nitrogen and phosphorus loading from municipal wastewater treatment plants is an ongoing threat to water quality, which leads to more stringent environmental regulations. Microalgae-mediated twinline systems are an interesting alternative for nitrogen and phosphorus removal since it provides a treatment to remove both nutrients efficiently coupled with the production of potentially valuable biomass. In the twinline system, microalgae are immobilized by self-adhesion on a wet, microporous, ultrathin substrate (the substrate layer). Subtending the substrate layer, a second layer, consisting of a macroporous fibrous material (the source layer), provides the growth medium. Tilt-layer effectively separate microalgae from the bulk of their growth medium, yet allow diffusion of nutrients. Nylon filter cloth and glass grid reinforced lamina were selected as the suitable substrate and source layer for twinline system, respectively. Immobilized green algae Scenedesmus rubescens and Thauera sp. showed similar higher growth rate and biomass productivity in a series of experiments at various algae supplied production rates. The results suggested that the twinline system was recommended for wastewater treatment in general. Removal of nitrogen and phosphorus from the real municipal wastewater by S. rubescens was investigated. During 54 days, S. rubescens grew well (1.03 g dry weight m-2 day-1), remained immobilized and removed phosphorus, nitrate and ammonium efficiently from four types of wastewater within short retention time (1-2 days), e.g. the residual phosphate-P was

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This dissertation, "Biological Removal of Phosphorus and Nitrogen From Wastewater: New Insights From Metagenomic and Metatranscriptomic Approaches" by Yanping, Mao, 毛艷萍, was obtained from The University of Hong Kong (Pokfulam, Hong Kong) and is being sold pursuant to Creative Commons Attribution 3.0 Hong Kong License. The content of this dissertation has not been altered in any way. We have altered the formatting in order to facilitate the ease of printing and reading of the dissertation. All rights not granted by the above license are retained by the author. Abstract: The study was conducted to reveal the insights of microbial diversity, functional profile and gene expression of microorganisms responsible for biological phosphorus removal (BPR) and nitrogen removal (NRR) in an extended aeration activated sludge (EAAAS) system. The structure and function of EBPR-related polyphosphate accumulating organisms (PAOs) and glycogen accumulating organisms (GAOs) among 14 globally located STPs and their monthly microbial variation in AS of Sha-Tin STP over five years were studied by using 16S rRNA gene pyrosequencing. The structure of EBPR-related microbial communities varied with the result of interaction of multiple operational variables and wastewater characteristics. Thauera-dominated (with relative abundances of 47% - 62%) microbial communities carrying out hydrogenotrophic denitrification were successfully enriched from various sources. The assemblages were characterized by 16S rRNA gene pyrosequencing. Nitrogen is high turnover and can be sequenced. The dominant culture were comparable to that of the model organism Paracoccus denitrificans. A genome binning pipeline was proposed to retrieve the dominant genome from the wastewater treatment system. The CAP IB-HUK-1 draft genome, being different from CAP IIA UW-1, does not possess the phosphotransferase in polyphosphate metabolism and V-ATPase for orthophosphate transport. Additionally, unlike CAP IIA UW-2, CAP IB-HUK-1 carries the genes for carbon fixation and nitrogen fixation. The metatranscriptomic results revealed that the most significantly up-regulated genes in CAP IB-HUK-1 from the anaerobic to the aerobic phase were responsible for assimilatory sulfate reduction, genetic information processing and phosphorus absorption, while the down-regulated genes were involved in NO2 reduction, PHA synthesis and acetyl-CoA biosynthesis. From another SBR, a draft genome affiliated to Accumulibacter Clade IC (CAP IIC HUK-2) was reconstructed using metagenomic sequence data sets. Comparative genomic analysis demonstrated that Accumulibacter of Clades IA, IB, IIA and IIC conserved the genes encoding for enzymes in glycolysis, the TCA cycle, acetate uptake, PHA synthesis and polyP metabolism, but differed in the abilities of nitrate reduction, nitrogen fixation and carbon fixation. The abundances of the Accumulibacter clades in 18 activated sludge (AS) samples from the globally distributed sewage treatment plants (STPs) were quantified by the qPCR-ppk1 assay. Clades IIC and IID were found to be dominant among the five Accumulibacter clades in 11 AS samples. And two novel Accumulibacter Clades IIA and IID were identified. The results indicated that the wastewater characteristics could be more important to determine the Accumulibacter clades than the geographic location. Geographical distribution of putative polyphosphate accumulating organisms (PAOs) and glycerogen accumulating organisms (GAOs) among 14 globally located STPs and their monthly microbial variation in AS of Sha-Tin STP over five years were studied by using 16S rRNA gene pyrosequencing. The structure of EBPR-related microbial communities varied with the result of interaction of multiple operational variables and wastewater characteristics. Thauera-dominated (with relative abundances of 47% - 62%) microbial communities carrying out hydrogenotrophic denitrification were successfully enriched from various sources. The assemblages were characterized by 16S rRNA gene pyrosequencing. Nitrogen is high turnover and can be sequenced. The dominant culture were comparable to that of the model organism Paracoccus denitrificans. A genome binning pipeline was proposed to retrieve the dominant genome from an enriched hydrogenotroph denitrifying consortium using metagenomic sequence data. A draft genome (Thauera R4) affiliated with a novel Thauera

Waste Water Treatment Processes for Phosphorus and Nitrogen Removal

The production of wastewater from various human and industrial activities has a harsh impact on the environment. Without adequate treatment, the disposal of this wastewater poses a threat to the quality of water globally. Technologies for the Treatment and Recovery of Nutrients from Industrial Wastewater investigates emergent research and best practices within the field of wastewater management. Highlighting novel technological tools in wastewater treatment, effective nutrient removal technologies, and innovative solutions to quality water preservation practices, this book is a critical reference source for professionals, scientists, academics, and students.

Carbon, Nitrogen, and Phosphorus Removal in Staged Nitrification-denitrification Treatment

This valuable new book offers practical guidance regarding the design and operation of systems for reducing effluent nitrogen and phosphorus. The principles of nitrogen and phosphorus removal are discussed, including sources of nitrogen and phosphorus in wastewater, removal options, nitrogen and phosphorus transformations in treatment, process selection, and treatment. The book also covers the design and operation of nitrogen and phosphorus removal systems, including system options, system design, facility design, facility costs, and operation. Practical case studies are provided as examples of successful system implementations that may be able to help you decide what will work best in your plant.

Biological Phosphorus Removal Activated Sludge Process in Warm Climates

Taking Advantage of Autotrophic Nitrogen Removal

This valuable new book offers practical guidance regarding the design and operation of systems for reducing effluent nitrogen and phosphorus. The principles of nitrogen and phosphorus removal are discussed, including sources of nitrogen and phosphorus in wastewater, removal options, nitrogen and phosphorus transformations in treatment, process selection, and treatment. The book also covers the design and operation of nitrogen and phosphorus removal systems, including system options, system design, facility design, facility costs, and operation. Practical case studies are provided as examples of successful system implementations that may be able to help you decide what will work best in your plant.

Aerobic Granular Sludge
Removal of Phosphorus and Nitrogen from Wastewater by Spray Irrigation of Land

Biological Phosphate Removal from Wastewaters contains the proceedings of an International Association on Water Pollution Research and Control Specialized Conference held in Rome, Italy on September 28-30, 1987. Contributors review advances that have been made in the removal of biological phosphates from wastewaters, both at the fundamental scientific level and in the practical application of the process. Topics range from the fundamental microbiology and biochemistry of the enhanced biological removal of phosphate to the practical full-scale plant experiences with phosphorus removal and sludge handling from such processes. This text is comprised of 43 chapters, the first of which describes the utilization of polyphosphate as an energy reserve in Acinetobacter sp. and activated sludge. Attention then turns to metabolic control in polyphosphate-accumulating bacteria and its role in enhancing biological phosphate removal. The biochemistry and energetics of biological phosphorus removal are also considered. The next section is devoted to process modeling and includes chapters that explore the kinetics of biological excess phosphorus removal; factors affecting anaerobic stabilization during biological phosphorus removal; and the behavior of magnesium in biological phosphate removal. In the next section, bench/pilot-scale studies are presented; one of which investigated the reduction of returned phosphorus from a sludge treatment process. The book concludes with a discussion on phosphate removal mechanisms and pilot- and full-scale experiences. This book will be of interest to students, practitioners, and policymakers in water pollution control.

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