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ANÁLISE DA SITUAÇÃO DO ACESSO À ÁGUA DA POPULAÇÃO DO BAIRRO CREMAÇÃO, BELÉM, PARÁ, BRASIL

ANALYSIS OF THE SITUATION OF ACCESS TO WATER IN THE POPULATION OF NEIGHBORHOOD CREMAÇÃO, BELÉM, PARÁ, BRAZIL

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Recibido el 7 de mayo de 2022. Aceptado el 11 de septiembre de 2023

Abstract

Issues related to regular access to safe and safe water have caused concern, bringing the need to counterbalance and re-evaluate the concept of availability of water resources in relation to a concept of scarcity. This study aimed to analyze the water access and use situation of the population living in the Cremação neighborhood, Belém-PA, through the Water Poverty Index. The methodology was composed by bibliographical research and information gathering in loco through the application of questionnaires. The Water Poverty Index was structured by the following components: Capacity, Water Resources, Use, Access and Environment, subdivided into subcomponents and variables. The neighborhood of Cremação presented the average Water Poverty Index of 6.46, a result consistent with the observed reality. The main problems reported were the presence of color and taste in the water and deficiencies in the basic sanitation system, such as the launching of domestic sewage in the drainage network and the occurrence of flooding. It can be concluded that the concept of water scarcity in the region is mainly related to the inefficiency of public managers and the lack of knowledge and awareness of the community.

Keywords: indicators, water poverty, water resources.

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DINÂMICA DA CONCENTRAÇÃO DE POLUENTES EM LAGOAS DE ESTABILIZAÇÃO TRATANDO LIXIVIADO DE ATERRO SANITÁRIO

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DYNAMICS OF THE POLLUTANTS CONCENTRATION IN STABILIZATION PONDS FROM A LANDFILL'S LEACHATE TREATMENT

Recibido el 9 de agosto de 2022. Aceptado el 29 de mayo de 2023

Abstract

Solid waste landfills are an appropriate and environmentally friendly disposal in the current solid waste Brazilian management model. The biological degradation process of solid waste generates a percolating liquid product of variable composition and flow with a high polluting potential denominated leachate. The specificity of the leachate characteristics makes it difficult to treat, especially in biological processes. In this context, this present study evaluated the physicochemical characteristics of the raw leachate as well as the dynamics of pollutants in a stabilization pond system, composed of Anaerobic Pond, Aerated Pond 1, Aerated Pond 2 and Polishing Pond from a solid waste landfill in order to determine the efficiency of the entire station. The study was carried out through the statistical analysis of existing data from 2002 to 2017, performed through analysis of variance (ANOVA) followed by the Tukey test, resulting from the monitoring of the Leachate Treatment Plant. The results in box plot graphs showed the concentrations of parameters throughout the treatment, demonstrating that the system has an average removal efficiency of 58.9% for BOD, 50.9% COD, 37.4% Ammoniacal Nitrogen and 53.1% Total Nitrogen. Regarding the series of solids, the system obtained low performance. Of the trace elements, only Pb showed significant variation as evidenced by ANOVA, considering $p < 0.05$. In general, the Tukey test ($p < 0.05$) demonstrated that there are no significant changes in concentrations between treatment units.

Keywords: aerated pond, anaerobic pond, heavy metals removal, leachate treatment.

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MONITORAMENTO AMBIENTAL DOS CÓRREGOS URBANOS NO MUNICÍPIO DE PALMAS – TO

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ENVIRONMENTAL MONITORING OF URBAN STREAM IN THE MUNICIPALITY OF PALMAS – TO

Recibido el 11 de agosto de 2022. Aceptado el 17 de abril de 2023

Abstract

In order to disseminate knowledge about the control of anthropic activities arising from the implementation of large urban centers, this research had the objective to analyze qualitative and quantitative parameters about the water bodies of the Palmas-TO city as a baseline to the actions of Ambient monitoring in the urban watersheds of this region. The study area is compost for 8 water bodies inside the macrozone of the territorial ordering of the municipium with the streams: Cachimbo, Sussuapara, Brejo Comprido, Prata, Machado, Santa Barbara e Taquari. It was determined the parameters physico-chemistry and microbiology of the stream's quality water. The evaluation of hydrological aspects was made by the flow measurements, using the equipment Flowtracker serial P5001 and Sontek riversurveyor M9. The water quality results were evaluated according to CONAMA Resolution 357/05, for Class 2 water bodies. The results provides evidences that the degradation of the water's quality in the urban streams is a result of the urban expansion, that requires control actions and land use planning in order to minimize the environmental impacts and enabling to follow the the water quality standards pre-established by the Brazilian legislation.

Keywords: water quality, quantitative aspects of water, urban streams, environmental monitoring.

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PREPARAÇÃO DE CARVÃO ATIVADO A PARTIR DA PIRÓLISE DE VAGENS DE FLAMBOYANT (*Delonix regia*)

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PREPARATION OF ACTIVATED CARBON FROM PYROLYSIS OF FLAMBOYANT PODS (*Delonix regia*)

Recibido el 21 de agosto de 2022. Aceptado el 25 de enero de 2023

Abstract

In recent years a growing problem that has been gaining space is the issue involved with the waste produced by human activities. The amount of solid waste produced and collected daily has taken on worrying proportions, since if not properly disposed of, this waste can cause damage to the environment, and to human beings themselves, being necessary to search for new technologies for the reuse of solid waste. The flamboyant (*Delonix regia*), is an ornamental species widely used for landscaping purposes, due to its beauty. The pruning residues of the flamboyant can be expressive, due to their quantity in several places. This work aimed to use the flamboyant pruning residue in the pyrolysis process for the production of activated carbon. The biomass was characterized through immediate analysis: volatile material (84.56%), ash (3.84%) and fixed carbon (11.57%). The pyrolysis experiments of the residue were carried out in a fixed bed reactor, at two different temperatures (350°C and 550°C) during 30 minutes of thermal degradation, in which an initial residue mass yield of 25.99% was obtained for the pyrolysis at 550° and 35.49% for pyrolysis at 350°C. After the pyrolysis tests, the charcoal samples obtained during the process were collected, stored and characterized by the same analytical techniques used with in Nature biomass, in addition to the methylene blue adsorption test on an orbital shaker table in which multivariable planning was used the delineation of centered faces with 7 types of combinations of mass and dye concentration, where all results had more than 80% efficiency, being the highest of them 85.93%.

Keywords: flamboyant, activated carbon, pyrolysis, pruning residue, solid waste.

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LOGÍSTICA REVERSA DE EMBALAGENS VAZIAS DE AGROTÓXICOS: ESTUDO DE CASO SOBRE O RECEBIMENTO ITINERANTE NO ESTADO DO CEARÁ

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REVERSE LOGISTICS OF EMPTY AGROCHEMICAL PACKAGES: A CASE STUDY ON THE ITINERANT RECEPTION IN THE STATE OF CEARÁ

Recibido el 31 de agosto de 2022. Aceptado el 28 de febrero de 2023

Abstract

The market for pesticides has expanded rapidly in recent years, especially in Brazil. When not handled properly, there is a great risk of ingestion of food treated with pesticides. Moreover, its use in agricultural activities can generate problems with the final disposal of empty packages, which are often disposed of inappropriately. From this perspective, this research aims to describe the reverse logistics system and present data on the itinerant collection of empty containers of pesticides in the state of Ceará. In order to collect information on the subject, technical visits were conducted to the Secretary of Environment of the State of Ceará and to the Reception Post for Empty Pouches of Agrochemical of Ubajara-CE. The data collected allowed us to verify that Ceará has three reception posts for empty containers of pesticides, located in the municipalities of Abaiara, Quixeré and Ubajara, to serve the 184 municipalities. The amount of information and official data available on the collection of empty containers of pesticides in the state does not allow us to know in depth the real situation of the reverse logistics system. The Campo Limpo System has revealed itself as a positive initiative in relation to the return of containers, however, it is essential to expand inspection and educational work in the field to increase the adhesion of farmers to the reverse logistics system.

Keywords: empty agrochemical packages, reverse logistics, itinerant receiving.

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CARACTERIZAÇÃO FÍSICA DE SOLOS DE COBERTURA E DE RESÍDUOS SÓLIDOS DO ATERRO SANITÁRIO METROPOLITANO OESTE DE CAUCAIA, CEARÁ, BRASIL

* Michael Lima Silva ¹
Gemmelle Oliveira Santos ¹
Roberto Antônio Cordeiro da Silva ²

PHYSICAL CHARACTERIZATION OF COVERAGE SOILS AND SOLID WASTE FROM THE METROPOLITAN LANDFILL WEST OF CAUCAIA, CEARA, BRAZIL

Recibido el 11 de septiembre de 2022. Aceptado el 13 de febrero de 2023

Abstract

The composition of the waste studied, by itself, anticipates that many internal changes will occur within the massifs after the end of the useful life of the landfill studied. In view of this, in this study tests were carried out on the gravimetric composition, apparent loose specific mass and moisture content and volatile solids of the MSW received in two areas (Area 1 and 2) of the Sanitary Landfill of Caucaia, Ceará, Brazil. At the same time, the permeability coefficients of the cover soils were determined, and their compaction and granulometric composition were determined. The research showed that between 2012 and 2021, the landfill received more than 20.5 million tons of MSW, its composition being mostly of easily degradable material, and the apparent specific mass of this material varied between 123.75 and 295.42 kg /m³. In Area 1, the humidity of the landfilled waste ranged from 20.97% to 34.54% and the volatile solids from 9.12% to 31.49%. In Area 2, these values were: humidity (24.25% to 63.13%) and volatile solids (24.36% to 95.44%). These results indicate that the organic matter of waste landfilled in a closed area (Area 1) is practically stabilized, while the waste landfilled in the new operating area (Area 2) showed higher values, showing the potential for degradation and biogas generation. The permeability of the covering soils in Area 1 of the landfill (3.6x10⁻⁴ at 1.0x10⁻³ cm/s) were higher than in Area 2 (1.9x10⁻⁶ at 3.1x10⁻⁵ cm/s), showing that over time, and under the weather, these layers lose their efficiency. In addition, the region's rainfall had a positive influence on the moisture content of the landfilled waste.

Keywords: landfill, municipal solid waste, cover layer.

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REVISTA AIDIS

de Ingeniería y Ciencias Ambientales:
Investigación, desarrollo y práctica.

**TRATAMIENTO FOTOCATALÍTICO DE FÁRMACOS
UTILIZANDO TiO₂: UMA ANÁLISE SISTÊMICA DOS
MECANISMOS DE DEGRADAÇÃO, REUSABILIDADE
E VIABILIDADE DO PROCESSO EM ESCALA REAL**

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Arthur Marinho Cahino¹

**PHOTOCATALYTIC TREATMENT OF DRUGS USING TiO₂: A SYSTEMIC ANALYSIS OF
DEGRADATION MECHANISMS, REUSABILITY AND FEASIBILITY OF THE PROCESS ON A REAL
SCALE**

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Abstract

Water contamination by pharmaceutical compounds into aquatic matrices is a current problem of our society. Heterogeneous photocatalysis is a widespread treatment to assess contamination by pharmaceutical compounds because it can neutralize and mineralize various organic contaminants. This paper did an analysis of the scientific publications about the use of heterogeneous photocatalysis in the treatment of pharmaceutical compounds. This was accomplished through a systematic review and a systemic analysis of a bibliographic portfolio (BP) using the Knowledge and Constructivist Development Process methodology (ProKnow-C). After a preliminary survey 33 out of 3,498 papers were selected to make up the BP. Those papers addressed the treatment of the following types of drugs: antibiotics, antihypertensives, analgesics and anti-inflammatory drugs. They also used TiO₂ as a reference catalyst. The studies mostly focused on improving TiO₂ photocatalysis by modification with metal doping and heterojunctions for the formation of new composites. The major reactive species identified in photocatalysis for the treatment of pharmaceutical contaminants was the hydroxyl radical (\bullet OH) regardless of different semiconductors being used, whereas the degradation mechanisms are repeated during the reaction, being intensified, or not, by experimental conditions. A catalyst was reutilized at most 5 times without a significant loss of efficiency, but some catalysts showed the best performance after the fourth reutilization. It is known that a real-world application of the process suffers from a gap in the performance analysis of photocatalysts in more adverse and complex conditions.

Keywords: emerging contaminants, photocatalysts, Proknow-C, systematic review.

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PRODUCTION OF GLYCOHYDROLASES FROM RESIDUES FROM THE FLOUR INDUSTRY BY *Aspergillus niger*

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Abstract

The liquid from cassava processing and the peel are agro-waste produced by the flour industry, a sector of great economic importance in Brazil. These residues can cause environmental impacts when disposed of improperly, due to their high concentration of carbohydrates and chemical demand for oxygen - COD. Faced with this demand, the objective of the present study was to carry out the bioremediation of cassava and cassava peel aiming at the production of glycohydrolases by two strains of *Aspergillus niger*, DR02 and AN 400. The tests took place in agitated medium, for 144 hours. The analyzes carried out were: glucose, pH, COD and the enzymes glucoamylase, xylanase and α -amylase. The results obtained showed a maximum COD reduction of 76 and 78% - DR02 and AN 400, respectively. The highest production of enzymes detected during this bioprocess, for the strains of *A. niger* DR02 and AN 400, were α -amylases (11.78 and 3.64 U/mL), glucoamylases (8.21 and 3.80 U/ml) and xylanases (2.66 and 1.43 U/ml), respectively. In view of the results reported here, it can be inferred that mycoremediation can be an alternative to manage waste from the flour industry, simultaneously generating value-added products that can be used in the food industry.

Keywords: biodegradation, remediation, fungi.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

**PROPOSTA DE ÍNDICE DE TRATAMIENTO DE
ESGOTO SANITÁRIO PARA ESTAÇÕES COM
A TECNOLOGIA UASB NO MUNICÍPIO DE
FORTALEZA, CE**

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Ana Bárbara de Araújo Nunes ¹

**PROPOSAL FOR SANITARY SEWAGE TREATMENT
INDEX FOR STATIONS WITH UASB TECHNOLOGY IN
THE MUNICIPALITY OF FORTALEZA, CE**

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Abstract

Wastewater Treatment Plants (WWTP) have the function of promoting the treatment of wastewater, thus being an option for mitigating water scarcity. Some of these WWTP, however, have problems in monitoring and evaluating their treatment processes, disposing of their effluents in disagreement with the environmental legislation of release, thus harming the health of the water bodies. The objective of this work consisted in the construction of a Sanitary Sewage Treatment Index (SSTI), as an innovative tool, which qualitatively analyzed parameters based on environmental legislation and assists in decision-making regarding the release of effluents from WWTP. For this, eleven WWTP were chosen, operating with the Upflow Anaerobic Sludge Blanket (UASB), located in Fortaleza-Ce, to evaluate their data on treated effluents between 2016 and 2020. The index was built using principal component analysis and WWTP were classified, based on compliance with environmental legislation, into three classes: unsatisfactory, satisfactory, and excellent. From the analysis of the applied indices, four stations were classified as unsatisfactory, four as satisfactory and three with excellent compliance with the legislation evaluated. Therefore, the index objectively represented the effluents and helped the decision making regarding the release into the water bodies.

Keywords: mitigation, discharge, UASB, index.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

AVALIAÇÃO DA POLUIÇÃO ATMOSFÉRICA EM UMA ÁREA URBANA NA CIDADE DE FORTALEZA, CEARÁ, BRASIL

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ASSESSMENT OF ATMOSPHERIC POLLUTION IN AN URBAN AREA OF FORTALEZA, CEARÁ, BRAZIL

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Abstract

The growing economic development associated with urban mobility has intensified the emission of pollutants into the atmosphere, which causes serious environmental and public health problems. Air quality assessment studies are important tools to support technical information that allow the establishment of public policies to mitigate air pollution damages. In this context, this study aimed to evaluate the air quality in an urban stretch in the city of Fortaleza, Ceará. The samplings were carried out between the months of September 2021 to March 2022, comprising the dry and rainy periods. The pollutants analyzed were the total suspended particulate (TSP), inhalable particulate (PM₁₀), fine inhalable particulate (PM_{2.5}), O₃, CO₂ and total volatile organic compounds (TVOC). The results showed mean concentrations of 37.9 µg/m³ of TSP; 25.4 µg/m³ of PM₁₀; 19.9 µg/m³ of PM_{2.5} and 39.8 µg/m³ of O₃ which are in accordance with the limits of the air quality standards recommended by Brazilian legislation. The CO₂ and TVOC levels observed were 564.5 ppm and 248.7 ppb, respectively. In general, the average concentrations of monitored pollutants reveal an urban environment with air quality classified as good.

Keywords: air pollution, air quality, health, urban environmental.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

PROPUESTA DE METODOLOGÍA PARA EL DESARROLLO DE UN SISTEMA DE GESTIÓN AMBIENTAL BASADO EN LA NORMA INTERNACIONAL ISO 14001:2015 PARA UNA EMPRESA DE LA INDUSTRIA AUTOMOTRIZ

Isabel Pulido Rodríguez ¹
* Tania García López ²

PROPOSED METHODOLOGY FOR THE DEVELOPMENT OF AN ENVIRONMENTAL MANAGEMENT SYSTEM BASED ON THE INTERNATIONAL STANDARD ISO 14001:2015 FOR A COMPANY IN THE AUTOMOTIVE INDUSTRY

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Abstract

The Initial Environmental Review is a tool for identifying the environmental situation of a company and each of its areas. This revision is not an indispensable requirement of ISO 14001:2015, nor is it mandatory to comply with it; however, it is a clear benefit to apply it. In 2014 the company under study implemented an Environmental Management System, based on ISO 14001 version 2004; however, in 2015 there was a change in the content of this international standard, all industries based on the previous version were affected. In addition, in 2017 the company expanded its infrastructure, triggering an expansion in operating systems. The objective of this paper was the elaboration of the proposal of a new Environmental Management System that was relevant to the turn of the organization, preparing an initial diagnosis of its environmental situation and identifying the points where the company was not complying with legal requirements. As a result of this work, a methodology was developed which is considered to be replicable in other companies in the sector, due to the excellent results obtained.

Keywords: automotive industry, environmental management system, environmental performance, initial environmental review, legal certainty.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

ONSITE SANITATION GOVERNANCE TOOLS FOR SMALL MUNICIPALITIES – FIRST STEPS FROM SANTA CATARINA STATE, SOUTH BRAZIL

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Luciane Dusi Pereira¹
Pablo Heleno Sezerino¹

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Abstract

Promoting sanitation solutions are more than just choosing the right technology. The need for stakeholders' cooperation and engagement challenges small municipalities to consider fecal sludge management (FSM) and simplified sewerage approaches, not only conventional systems, promoting a flexible suite of services and emerging governance discussion in this complex scenario. In this paper, we conducted 10 semi-structured key informant interviews (KII) and show 15 implemented governance tools in 5 municipalities with less than 10,000 inhabitants, in Santa Catarina State, in the Brazilian southern region. None of the researched municipalities showed a systematized framework and the governance structure is composed of dispersed tools, mainly developed in response to a public attorney, who acts as a blind sponsor of onsite solutions, calling other stakeholders for action. Onsite sanitation performs a relevant role to achieve service universalization, this paradigm shift requires a new governance structuring model that considers FSM as a part of this ecosystem seems to be the trail first step especially where the conventional approach does not always reach financial sustainability.

Keywords: fecal sludge management, decentralized sanitation, safe sanitation for all, sanitation governance, sanitation for small cities.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

REMOÇÃO DE CORANTES EM EFLUENTE TÊXTIL UTILIZANDO BIOCARVÃO DE FOLHAS DE *Persea americana Mill.*: ESTUDO ISOTÉRMICO E COLUNA DE ADSORÇÃO

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DYES REMOVAL IN TEXTILE EFFLUENT USING BIOCHAR OF *Persea americana Mill.* LEAVES: ISOTHERMAL STUDY AND ADSORPTION COLUMN

Recibido el 4 de octubre de 2022. Aceptado el 1 de febrero de 2023

Abstract

The textile industry generates large volumes of effluents with a high concentration of dyes. The treatment of these effluents with alternative adsorbents has been investigated. Preliminary studies have shown that the biochar produced with leaves of *Persea americana Mill.* was efficient in removing dyes. Thus, in a complementary way, the present work evaluated the removal efficiency of the dyes *Levafix Brilliant Red* and *Remazol Preto B 133%* in synthetic textile effluent with the new adsorbent in two stages: a) isothermal studies and b) tests in adsorption column with continuous flow. Five isothermal models were studied. The Langmuir model was the best fit for the data, with an R_L of 0.001, indicating that the adsorption is favorable. In the adsorption columns, the adsorption capacity of the dyes was 8.71 mg.g^{-1} of adsorbent. Therefore, the study demonstrated that the alternative adsorbent could be used to efficiently remove dyes in a continuous process and with reduced costs.

Keywords: alternative adsorbent, continuous flow adsorption column, isothermal study, *Persea americana Mill.*, synthetic textile effluent.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

PRÉ-TRATAMIENTO DE LIXIVIADO DE ATERRO SANITÁRIO POR ALCALINIZAÇÃO E PRECIPITAÇÃO QUÍMICA

PRE-TREATMENT OF LANDFILL LEACHATE BY ALKALINIZATION AND CHEMICAL PRECIPITATION

Recibido el 6 de octubre de 2022. Aceptado el 8 de mayo de 2023

Abstract

This work had the objective to study the economic and environmental viability of the application of commercial hydrated lime type I (CH-I) and analytical standard sodium hydroxide (NaOH P.A) in alkalization/chemical precipitation processes using landfill leachate. For this, in May/2021, approximately 1 m³ of leachate was collected from the Sanitary Landfill in Campina Grande (ASCG), Paraíba, Brazil, in a tank truck, which was stored in a polyethylene reservoir, in the physical dependencies of the Federal University of Campina Grande, Headquarters Campus. Subsequently, about 0.001 m³ of leachate were collected, in triplicate, to accomplish the alkalization tests, which aimed to increase the hydrogenic potential (pH) of the referred effluent to 10 ± 1 and 12 ± 1 and to verify the chemical precipitation of copper (Cu), chromium (Cr) and nickel (Ni), as well as the removal of color, turbidity and total ammoniacal nitrogen (NAT), using CH-I and NaOH P.A. The results showed that 28.45 g of CH-I and 5.59 g of NaOH P.A were needed to raise the pH of the leachate to 10 ± 1. Regarding the economic aspect, it is more advantageous to use CH-I in the process of alkalization/chemical precipitation, since its cost was about 12 (pH = 10 ± 1) and 17 (pH = 12 ± 1) times lower compared to NaOH P.A. It was observed that CH-I presented the best performance in the reduction of apparent color (60 to 90%) and NAT (> 8%), and had similar efficiency to NaOH P.A in the removal of Cr (pH = 12 ± 1), Cu and Ni, reaching values higher than 30, 90 and 40%, respectively. In view of the above results, it was concluded that, both from an economic and environmental point of view, CH-I proved to be the best chemical species to be applied in alkalization/chemical precipitation processes using leachate from a landfill in a semi-arid region.

Keywords: heavy metals, total ammoniacal nitrogen, hydrated lime, sodium hydroxide, semi-arid.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

UMA ANÁLISE QUANTITATIVA SOBRE O ESTADO TRÓFICO EM RESERVATÓRIOS NO CEARÁ, SEMIÁRIDO BRASILEIRO

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Luciana Mara Cardoso Freitas ¹
Gustavo Ross Ribeiro Lima ¹
Andrea Limaverde de Araújo ¹
Fernando José Araújo da Silva ¹

A QUANTITATIVE ANALYSIS ON THE TROPHIC STATE IN RESERVOIRS IN CEARÁ, BRAZILIAN SEMI-ARID

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Abstract

This paper shows the eutrophication degree in artificial lentic structures located in the Brazilian semiarid. Fourteen reservoirs were sampled quarterly from 2015 to 2021. The study variables comprised the fraction of available volume (AV) in the day of sample collection, annual rainfall (P_p), total nitrogen (N), total phosphorus (P), chlorophyll a (Chla), transparency (Z) and density of cyanobacteria (CB). The Trophic State Index (TSI) was determined in the reservoirs. Also, among the information of the study, bivariate analysis (through correlations) and multivariate analysis (through Principal Components Analysis) were performed. The values of TSI showed Eutrophic state character. For annual cycles both arithmetic and geometric means can be applied. The climatic association variables (AV and P_p) had negative effect on the accumulation of nutrients and consequent increase in eutrophication. Multivariate analysis suggested similar results. However, internal phenomena in water seem to be stronger than those related to climate in driving eutrophication. Findings also showed that cyanobacterial density is enhanced by $N:P < 20$ had no significant association with climatic variables.

Keywords: climate effect, eutrophication, water monitoring.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

INDICADORES DE SUORTE AO GERENCIAMENTO MUNICIPAL DAS ÁGUAS PLUVIAIS URBANAS NO BRASIL

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Joel Avruch Goldenfum¹

SUPPORT INDICATORS FOR MUNICIPAL MANAGEMENT OF URBAN STORMWATER IN BRAZIL

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Abstract

The use of indicators and indexes for the management of urban stormwater by Brazilian municipal managers has become widespread in recent years, although it is still incipient. However, high subjectivity and uncertainties associated with the elaboration of indicators and indices, interpretation and application of results by decision makers are observed. This work aims to propose a set of indicators based on problems related to the management of urban stormwater to assist in municipal decision-making, for the Brazilian reality. To achieve this objective, problems related to the management and handling of urban stormwater were identified, a set of simple indicators was structured, related to simple indicators and problems, in a systematic way and, finally, the validation was carried out. The set of indicators developed has 42 simple indicators with capacity of identifying 88.14% of the total of 59 problems listed related to the management of urban stormwater. The validation of the systematization showed satisfactory results, however, the lack of information and data is still a limiting factor for stormwater management tools in Brazil to be improved and widely used.

Keywords: index, management tool, public managers, decision making.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

IMPOSEX IN *Stramonita brasiliensis* (MOLLUSCA: GASTROPODA) IN PORT TERMINAL OF CEARÁ: ENVIRONMENTAL ASSESSMENT AND PERCEPTION

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Rafaela Camargo Maia ^{1,2}

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Abstract

Imposex consists of the appearance of male sexual structures in female gastropods exposed to contamination containing organotin compounds (OTCs). Molluscs of the genus *Stramonita* are highly sensitive to OTC's, making this taxon the world's bioindicator of tin contamination. The aim of the study was to evaluate the environmental perception of fishermen about the origin and use of OTCs in port areas on the west coast of Ceará. Fifty specimens of the species were collected at each of four fishing ports and evaluated. Interviews were also carried out with fishermen, boat owners and paint dealers to determine the origin and use of OTCs. The incidence of imposex in *S. brasiliensis* was observed in three of the locations sampled. The species was not found in Porto Pesqueiro de Acaraú, which may have been the result of years of OTCs use. The highest incidence of imposex was recorded at Praia da Pedra Rachada in Paracuru (69.44%), followed by Porto dos Barcos in Itarema (69.18%) and Porto Pesqueiro de Camocim, with the latter having the lowest incidence of the syndrome (51.22%). The information obtained in the interviews revealed that even after the ban on the use of OTCs in antifouling paints, these contaminants continue to reach ports through alternative sources such as legally marketed insecticides. The occurrence of imposex in these samples strongly suggests that these areas are contaminated by OTC's. Studies based on the development of imposex are important tools for monitoring environmental conditions and conserving biodiversity.

Keywords: benthos, contamination, boats, muricidae, fishing port, tributyltin (TBT).

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Investigación, desarrollo y práctica.

SENSORES DE MATERIAL PARTICULADO EN SUSPENSIÓN DE BAJO COSTO: INTEGRACIÓN AL MONITOREO DE LA CALIDAD DEL AIRE

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Julio Vassallo²

LOW-COST SUSPENDED PARTICULATE MATTER SENSORS: INTEGRATION INTO AIR QUALITY MONITORING

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Abstract

Advances in knowledge about the health effects of atmospheric particles, as well as their influence on climate and climate change, have led to the demand for monitoring their levels in ambient air and the reliable determination of ambient concentrations at surface level, carried out in most countries with reference instruments. However, the cost and resources required for the acquisition and operation of these reference instruments hinder the installation of air quality monitoring networks. In recent decades, there has been a great deal of international development of air pollutant sensors that, although not regulatory, are portable, lower cost and relatively easier to operate than reference instruments. Advances in microprocessors and miniaturization have allowed the introduction of these sensors, facilitating an unprecedented increase in their use for non-regulatory air quality assessment purposes. Although the use of low-cost sensors in personal and public health care is accepted, the concern arises when the data obtained are used as substitutes or complements to reference networks for air quality monitoring. The purpose of this article is to contribute to the regional discussion of guiding criteria for the use of low-cost atmospheric particulate sensors. The work is based on the review of about fifty scientific articles published in the last decade.

Keywords: atmospheric aerosols, low cost sensor, particle size, reference instrument, suspended particulate matter.

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