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La Revista AIDIS de Ingeniería y Ciencias Ambientales: Investigación, desarrollo y práctica es una publicación electrónica cuatrimestral coeditada por AIDIS y el Instituto de Ingeniería UNAM. Publica contribuciones originales de calidad y actualidad evaluadas por pares, dentro de su área de competencia. Se presentan trabajos que abarcan aspectos relacionados con el conocimiento científico y práctico, tanto tecnológico como de gestión, dentro del área de Ingeniería y Ciencias Ambientales en Latinoamérica.

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COBERTURA FINAL DE ATERROS SANITÁRIOS: UMA ABORDAGEM CONSERVACIONISTA AMBIENTAL

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FINAL COVERS FOR LANDFILLS: AN ENVIRONMENTAL CONSERVATIONIST APPROACH

Recibido el 21 de mayo de 2018; Aceptado el 6 de febrero de 2020

Abstract

The top layer is one of the most important compartment of the final cover in landfills, because, besides its geotechnical aspects concerning safety, it is directly associated with the functionality of the vegetation cover. In the present work we show that the material present in the top layer of the final cover of the investigated landfill has a heterogeneous character, presents an average depth of 28.9 cm with minor physico-chemical variations as a function of the position along the slope. Considering potentials for plant cover and maintenance, the substrate is alkaline, with low organic matter content, presenting borderline concentrations of heavy metals, significant variation in moisture content, and high average density, 1.6 g.dm⁻³. Adjustments in organic matter and density are the main attributes to be considered during the construction of the top layer of the final cover. Our results indicate that soils built in the final cover of landfills present particularities of behavior that justify the adoption of conservation practices during their construction and maintenance, highlighting adjustments in composition, compaction controlling and plant species suitability.

Keywords: solos construídos, áreas degradadas, aterros sanitários, camada de cobertura final, cobertura vegetal.

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PRODUÇÃO DE MATERIAIS RENOVÁVEIS UTILIZANDO BIOMASSA AGROINDUSTRIAL (SOJA) POR MEIO DE REATOR TERMOQUÍMICO

Fabrcio Machado Silva¹
Luciana Rezende Alves de Oliveira¹
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Aymara Gracielly Nogueira Colen²
Pedro Henrique Borges do Amaral²
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PRODUCTION OF RENEWABLE MATERIALS USING AGROINDUSTRIAL BIOMASS (SOYBEAN) BY MEANS OF THERMO-CHEMICAL REACTOR

Recibido el 5 de junio de 2019; Aceptado el 18 de septiembre de 2020

Abstract

Among the most abundant lignocellulosic residues in the Brazilian agribusiness, soybean hull stands out. In Brazil, the cultivation of soy represents 57.2% of the total area cultivated with grains, being the second largest world producer in grains, which reached a production of 95.4 million tons in the 2015/2016 harvest. It is estimated that the soybean crop produces about 2,700 t of waste for every 1,000 t of processed grains. The present work aims to effect the thermal degradation of soybean husk and bran for the production of bioproducts (bio-oil and activated carbon), the latter being used in the manufacture of filters for the removal of chlorine from the water supply. Pyrolysis was carried out in a fixed bed reactor with temperatures ranging between 500 and 700 °C. The following process variables were studied: temperature, heating rate, inert gas flow and reaction time. The moisture content of the husk was 3.71% and 9.89% for the bran. The content of volatile material in the husk (90.02 %) was quite expressive, as well as the bran (84.21%). The products generated during the pyrolysis tests were: solid fraction (husk-30.0%; bran-28.33%) and liquid (husk-47.19%; bran-43.70%), with potential for commercial / industrial use. The activated carbon obtained from the two residues (husk and bran) was efficient in the process of removing chlorine from the water supply. The efficiency in the removal of chlorine in a filtration system with coal in this research was 100% over the monitored period.

Keywords: reuse, technological routes, waste.

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ESTUDIO DE CASO DE LA LAGUNA ALALAY, BOLIVIA: TRECE AÑOS DE DINAMICA AMBIENTAL EN UNA LAGUNA EUTROFIZADA

* Cesar A. Perez-Fernandez ¹
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CASE STUDY AT LAGUNA ALALAY LAKE, BOLIVIA: THIRTEEN YEARS OF ENVIRONMENTAL DYNAMICS OF AN EUTROPHIED LAKE

Recibido el 14 de enero de 2019; Aceptado el 4 de mayo 2020

Abstract

Human activities provoke drastic changes in aquatic ecosystems that result in events such as eutrophication, algal blooms, massive fauna mortality, and, in extreme cases, the complete loss of the aquatic resources. Some of these events were registered at Laguna Alalay Lake in Cochabamba, Bolivia in 2016. We present a case study with the aim of detecting relevant changes in Alalay's environmental parameters in recent years. The study was done by the use of descriptive statistics for the period 2003 -2016. Although data gaps exist because of inconsistent monitoring of the lake, results show that levels of phosphorus and nitrogen remain high over time despite the changes in precipitation and influent levels. The high levels of nutrients suggest that Alalay receives a constant influx of untreated sewage and run-off as sources of nutrients, and the main culprit seems to be the Rio Rocha River. The alkaline pH, in conjunction with the possible increasing in conductivity, were likely factors triggering a cyanobacterial bloom following by massive death of the resident fauna. Under the current conditions, algal blooms may be a recurrent problem in the lake. We recommend the continuous environmental monitoring, wastewater treatment, and a pattern of inclusion of the local community are critical activities for the restoration of the body of water. We propose to use this approach in cases when only incomplete data sets are available.

Keywords: Alalay Lake, eutrophication, missing data, nitrogen, phosphorus.

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RELAÇÃO ENTRE FÓSFORO TOTAL E VAZÃO AFLUENTE NOS PRINCIPAIS RESERVATÓRIOS RURAIS DO ESTADO DO CEARÁ NO SEMIÁRIDO BRASILEIRO

Maria de Jesus Delmiro da Rocha¹
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RELATIONSHIP BETWEEN TOTAL PHOSPHORUS AND AFLUENT FLOW IN MAIN RURAL RESERVOIRS OF THE STATE OF CEARÁ IN BRAZILIAN SEMIARID

Recibido el 23 de enero de 2019; Aceptado el 6 de febrero 2020

Abstract

Water quality in interannual reservoirs in the Brazilian semiarid region is extremely important, mainly due to eutrophication, whose excessive nutrient input, notably total phosphorus, is a determining factor in this process. In this study, the behavior of the total phosphorus concentration was modeled as a function of the inflow in two serial reservoirs in the semiarid region of Ceará: Orós and Castanhão. Simplified models were proposed relating these variables through regression analysis. A water quality analysis was also carried out regarding compliance with CONAMA Resolution 357/2005 for total P and concentration values exceeded by 10% and 90% of the evaluated time, were obtained and discussed. Finally, a scenario analysis of the impact of different concentrations of total affluent P on the total P concentration in the water column of the reservoirs was performed. The results showed that the total phosphorus concentration presents a simple dilution regime in the proposed models ($P < 0.0001$), responding inversely to the inflow. There was also a decrease in the concentration in the upstream reservoir compared to the downstream one, corroborating the results available in the literature for other regions. Finally, it was observed that the reservoirs were in disagreement with the Resolution for total P in 89.5% and 82.4% of the time analyzed in Orós and Castanhão, respectively, and that they do not reach the limit values for total P concentration for class II even though the inflow falls within the resolution for lotic environments.

Keywords: inflow, reservoirs, semiarid, total phosphorus, water quality.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

ESTUDO DAS EMISSÕES DE BIOGÁS EM CAMADAS DE COBERTURA DE ATERRO DE RESÍDUOS SÓLIDOS URBANOS

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STUDY OF BIOGAS EMISSIONS BY TOP COVER OF MUNICIPAL SOLID WASTE LANDFILLS

Recibido el 25 de enero de 2019; Aceptado el 18 de enero 2020

Abstract

This work evaluated biogas emissions over time in an experimental cell located at the Muribeca solid waste landfill, Jaboatão dos Guararapes / PE, Brazil. In this sense, measurements of flow rates and concentrations of methane (CH₄) and carbon dioxide (CO₂) were made by the drainage system and the coverage layer over a period of 3 years. Determination of the flow of CH₄ and CO₂ in the gas drains was performed by inserting a thermo-anemometer transversely to the direction of flow of the gas flow in the pipe and cover layer static flow. Three-layer configurations were used, the first layer, called the conventional layer was formed by compacted soil, the second layer, called the capillary barrier, consisted of a crushed stone sublayer and a compacted soil sublayer, and the third layer, called oxidative layer, was composed of a mixture of soil and organic compost. During the monitoring period it can be observed that the biogas emissions by the cover layers were lower in the rainy periods, the Capillary Layer for example, in the rainy season presented emissions of 2% of CH₄ and 4% of CO₂, while in the dry season. it had emissions of 9% of CH₄ and 25% of CO₂.

Keywords: biogas, coverage layer, drainage system, emissions, solid waste landfill.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

AVALIAÇÃO DE ESTABILIDADE DE TALUDES DE ATERROS SANITÁRIOS

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AVALIAÇÃO DE ESTABILIDADE DE TALUDES DE ATERROS SANITÁRIOS

Recibido el 28 de enero de 2019; Aceptado el 20 de enero 2020

Abstract

The increase in solid waste generation rates, as well as the lack of suitable waste disposal areas, has been demanding an increase in the useful life of landfills. This situation leads to the construction of progressively high landfills, alleviating the problem of waste demand but, on the other hand, generating major concerns about the stability of these constructions. The aim of this research was to evaluate the stability of slopes of municipal solid waste masses, by means of the retroanalysis, performing the modeling of landfills that had rupture, which had their rupture simulated and that did not show rupture, using the software SLOPE/W from GeoSlope International. Through the verification of the stability in conditions of efficient drainage and obstructed drainage, it was possible to evaluate the influence of the level of leachate in the stability, where a decrease of up to 39.18% in the safety coefficient was obtained in one of the cases.

Keywords: landfill, landfill rupture, retroanalysis, stability.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

LOGÍSTICA REVERSA DE MEDICAMENTOS EM DESUSO: AVALIAÇÃO DA SITUAÇÃO DA BACIA HIDROGRÁFICA DO RIO BELÉM, NA REGIÃO SUL DO BRASIL

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DRUG TAKE-BACK PROGRAM: ASSESSMENT OF THE SITUATION OF THE HYDROGRAPHIC BASIN OF BELÉM RIVER, IN SOUTHERN BRAZIL

Recibido el 30 de enero de 2019; Aceptado el 4 de mayo de 2020

Abstract

In Brazil, the drug take-back of unused drugs is not yet established by law at the national level. But several states and municipalities already have specific laws that regulate it, such as Paraná and the city of Curitiba. The state of Paraná was one of the pioneers in drug take-back program in Brazil and is one of the most advanced states in the matter. The main objective of this research was to evaluate the percentage of pharmacies in the Belém river basin, the main river in Curitiba, the capital of the state of Paraná, which are collecting unused drugs and whether these systems are complying with municipal and state laws. To achieve the proposed objective, a random sampling was carried out in pharmacies in the basin, collecting information through interviews. The results indicated that only 24% of pharmacies in the basin are collecting unused drugs. And that all visited pharmacies, with drug collection systems, are at disagreement with the laws. Because there is still no sectoral agreement and these initiatives are still efforts by pharmacy networks or pharmacies.

Keywords: drug take-back, pharmaceuticals management, Belém river basin.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

ESTAÇÕES DE TRATAMENTO DE ESGOTO SANITÁRIO DO BRASIL E DA COSTA RICA: ESTUDO DE CASO COMPARATIVO DAS CONDIÇÕES DE QUALIDADE DO ESGOTO BRUTO, DO EFLUENTE E EFICIÊNCIA DE REMOÇÃO DE MATÉRIA ORGÂNICA E SÓLIDOS

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WASTEWATER TREATMENT PLANS OF BRAZIL AND COSTA RICA: COMPARATIVE CASE STUDY OF RAW WASTEWATER AND EFFLUENT QUALITY AND REMOVAL EFFICIENCY OF ORGANIC MATTER AND SOLIDS

Recibido el 31 de enero de 2019; Aceptado el 2 de octubre 2019

Abstract

This article aims to evaluate 11 Wastewater Treatment Plants (WWTPs) from Costa Rica and Brazil, by comparing its Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and Total Suspended Solids (TSS) in the raw sewage and in the effluent. Regarding the raw sewage composition, significant differences ($\alpha = 5\%$) between both countries were found for COD and TSS, with no significant differences for the BOD concentrations. In addition, Activated Sludge (AS)-based WWTP from Brazil showed a statistically significant better performance than the Costa Rican ones. Among the Brazilian WWTP, AS-based systems (two different variants were evaluated) had a better performance than the Upflow Anaerobic Sludge Blanket (UASB) reactor-based systems with a post-treatment of Trickling Filter (TF). Finally, in the case of the AS-based WWTP of Brazil, no statistically difference was detected in regards of their compliance of the Brazilian or the Costa Rican discharge limits for the three considered parameters, even when the Costa Rican compliance limits are more stringent.

Keywords: sewage, activated sludge, trickling filter, UASB reactor, effluent quality.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

AVALIAÇÃO HIDRODINÂMICA E DE DESEMPENHO EM WETLAND CONSTRUÍDO VERTICAL DE FUNDO SATURADO EMPREGADO NO TRATAMENTO DE ESGOTO SANITÁRIO

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HYDRODYNAMIC AND PERFORMANCE EVALUATION IN PARTIALLY SATURATED VERTICAL FLOW CONSTRUCTED WETLAND FOR URBAN WASTEWATER TREATMENT

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Abstract

Constructed wetlands (CW) are ecotechnologies widely used for secondary and advanced wastewater treatment. Among typical configurations, vertical flow CW (VFCW) has become noticeable and has been intensified purposing to improve carbonaceous organic matter removal and nitrogen transformations. Partially saturated VFCW (VFCW-PS) stands out due to not require external energy source, which prevail inside of it oxidative and reductive conditions. Therefore, in this study hydrodynamic and treatment performance on VFCW-PS was evaluated under design and operational conditions. The VFCW-PS had 7.5 m² of surface area, 0.75 m total depth, being the last 0.40 m saturated with the effluent. The bed media was composed of 0.03 m thickness of fine gravel layer on the top (n.1), 0.62 m of coarse sand intermediate layer ($d_{10} = 0.29$ mm; $d_{60} = 1.16$ mm; Uniformity = 4.05) and 0.10 m of fine gravel layer on the bottom. The macrophyte employed was *Typha domingensis*, which was initially planted at a ratio of 4 plants / m². VFCW-PS received a medium organic loading rate of 38.27 ± 16.31 gCOD/m².day and a hydraulic loading rate of 83.4 ± 4.76 mm/day, with an intermittent feeding with 3 and 4 pulses per day with 3.5 resting period. The treatment performance of the VFCW-PS was evaluated throughout 42 months, based on the loading rate removal from the treatment unit, analysis along the depth of the bed media and during the drainage time duration of the treated wastewater. Moreover, tracer tests with saline tracers were realized for Hydraulic Retention Time (HRT) determination of the VFCW-PS. Results indicated an areal removal load of 34, 4.5, e 2.25 g/m².day of COD, N-NH₄⁺ and P-PO₄³⁻, respectively, as also an alkalinity consumption along the thickness of the bed media. HRT observed (0.88 and 1.01 days) in VFCW-PS was close to the theoretical. VFCW-PS presented itself as a potential intensification of classical modality of VFCW, highlighting the efficiency of 93 % on carbonaceous organic matter and 69 % and 82 % for nutrients N-NH₄⁺ e P-PO₄³⁻, respectively

Keywords: vertical flow constructed wetland, saturation, tracer test, areal removal load, redox potential.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

ANÁLISE DOS DADOS DE MONITORAMENTO DE QUALIDADE DE ÁGUA DE UMA BACIA HIDROGRAFICA NA PROPOSTA DE UM ÍNDICE QUALIDADE DE ÁGUA URBANO (IQA_U)

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ANALYSIS OF WATER QUALITY MONITORING DATA FROM AN HIDROGRAFIC BASIN IN THE PROPOSAL OF AN URBAN WATER QUALITY INDEX (IQA_U)

Recibido el 2 de febrero de 2019; Aceptado el 6 de diciembre de 2019

Abstract

The monitoring of water quality parameters from a hydrografic basin (BH) consumes time and financial resources. In addition, it generates a voluminous and often difficult to interpret database. In order to make water quality monitoring more advantageous and less costly for a specific purpose, this study grouped the information obtained in the monitoring of the waters of streams, located in a BH with 93.7km², urban influence (in 36.3% area), regarding of the physical-chemical and biological characteristics, using, for this, the Principal Component Analysis (PCA). Surface water samples were collected during January 2015 to May 2016 at five sample points. The qualitative parameters analyzed were those that compose the Water Quality Index - CETESB (IQA). The PCA allowed the selection of three PCs explaining 69.17% of the total variance. The final analysis allowed a reduction in 45% of the parameters measured in urban waters: Thermotolerant Coliforms; Biochemical oxygen demand; Turbidity; pH; and, Dissolved Oxygen. Thus, the water quality of the studied basin can be inferred and measured, with similarity in determining the quality categories in 71% of the cases when compared to the IQA, being possible to form a new index: Urban Water Quality Index (uWQI).

Keywords: multivariate statistics, water quality, water quality indicators.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

PROPOSIÇÃO DE REUSO DA ÁGUA RESIDUÁRIA DE UMA USINA SUCROALCOOLEIRA SITUADA NO INTERIOR DE SÃO PAULO

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PROPOSITION OF REUSE OF RESIDUE WATER FROM A SUGAR-ALCOHOL PLANT SITUATED IN THE INTERIOR OF SÃO PAULO

Recibido el 19 de febrero de 2019; Aceptado el 28 de octubre de 2019

Abstract

The objective of this work was to evaluate the possibility of reuse of wastewater from a sugar and ethanol plant in the interior of the State of São Paulo in the various sectors within the plant. With the five-month sampling period on random days, it was possible to observe a large variability of the organic load concentration in terms of COD ranging from 2396.2 to 101292.4 kg / day. In the composite sampling, the COD / COD ratio of 75% was obtained, representing that 75% of the COD was in the dissolved form and 25% in the suspended form. The BOD of 1460 mg.L⁻¹ compared to 2.306 mg.L⁻¹ of COD filtered represented the filtered BOD / COD ratio of 63% indicating that the 63% dissolved material is biodegradable. After the studies carried out in the wastewater generated at the plant, two treatments were proposed, being a physicochemical only for uses in which the amount of organic matter does not influence and for more demanding uses a physical-chemical treatment followed by an anaerobic biological treatment UASB and following an aerobic treatment in activated sludge reactors. The proposed points for the reutilization of treated waste water were the imbibition of sugarcane in the mill, in the metal conveyor of the mill, in the soaking of the vacuum filters, in the cleaning of the evaporation boxes and other equipment in the industry.

Keywords: sugar and ethanol plant, wastewater, wastewater reuse.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

EVALUATION OF DIFFERENT METHODS OF ESTIMATION OF THE TOPOGRAPHIC FACTOR AND ITS INFLUENCE ON SOIL LOSS DISTRIBUTION IN THE JAÚ STREAM WATERSHED, IN APARECIDA D'OESTE – SP

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Abstract

Concern about the environment and the need for solutions to environmental problems are growing every day. Among the various types of research carried out in this field, the study of soil erosion is highlighted, especially the accelerated erosion. Several methods are used to evaluate the occurrence of erosion processes, and the parameters considered in each one of them can also be diverse, being both natural and anthropic. The Universal Soil Loss Equation (USLE) is one of the most widespread methodologies used in this research field. Among the six parameters considered in the USLE, there is the topographic factor (LS), which refers to the influence of relief on the occurrence and development of erosion processes, being this a relevant factor and whose importance is already demonstrated. There are many ways to estimate topographic factor, and this work will analyze the distribution of soil loss in the Jaú Stream watershed, in Aparecida D'Oeste-SP, obtained through USLE, in view of these different estimation methods.

Keywords: erosion, GIS, topographic factor, USLE.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

GESTÃO E HIERARQUIZAÇÃO DE ROTAS TECNOLOGICAS DE RESÍDUOS SÓLIDOS URBANOS. UM ESTUDO DE CASO DO BRASIL

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MANAGEMENT AND HIERARCHIZATION OF TECHNOLOGICAL ROUTES OF URBAN SOLID WASTE - A CASE STUDY IN BRAZIL

Recibido el 28 de febrero de 2019; Aceptado el 18 de febrero de 2020

Abstract

En Brasil, la eliminación se lleva a cabo principalmente a través de prácticas inadecuadas, lo que conduce a daños ambientales, dado el poder de contaminación de los residuos sólidos que eventualmente difunden la contaminación del suelo, los recursos hídricos, la proliferación de aire y vectores, generando así varios problemas de salud pública. Ante este escenario, las autoridades brasileñas preocupadas por estos riesgos, promulgaron la Ley N ° 12.305 / 2010 que discute la Política Nacional de Residuos Sólidos (PNRS), cuyo objetivo es prevenir y reducir la generación de residuos sólidos, proponiendo hábitos. Herramientas e instrumentos sostenibles para aumentar el reciclaje y la reutilización de los residuos sólidos y la eliminación adecuada de los residuos. Con base en el PNRS y centrándose en el escenario de los municipios de Agreste Pernambucano, y de esta forma se estudiaron los estándares ambientales para la disposición final de residuos sólidos urbanos (RSU), el modelo de gestión de RSU y el uso de una herramienta de apoyo. a la decisión aplicada a los municipios de: Agrestina, Altinho, Bonito, Belém de Maria y Lagoa dos Gatos, que forman parte de COMAGSUL - Consorcio de los Municipios de Agreste y Mata Sul. Para este propósito, se utilizó la herramienta IST Versión 1.0 2013. permitir la jerarquía de rutas tecnológicas de tratamiento y destino final de los residuos, además del análisis comparativo con la gestión adoptada en Brasil y para el estado de Pernambuco. El uso de la herramienta resultó en la indicación de tres rutas tecnológicas con alto índice de sostenibilidad ambiental por parte de la herramienta IST.

Keywords: solid waste, management, PNRS, applied decision tool, technological routes.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

ANÁLISE DO CICLO DE VIDA DO PROGRAMA DE COLETA SELETIVA DO PLÁSTICO NO MUNICÍPIO DE JOÃO PESSOA/PB – BRASIL

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ANALYSIS OF THE LIFE CYCLE OF THE SELECTIVE PLASTIC COLLECTION PROGRAM IN THE MUNICIPALITY OF JOÃO PESSOA / PB – BRAZIL

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Abstract

Nowadays with the unstoppable production of solid residues, the selective waste collection appears as a possible destination for this sum produced. The plastic is a recyclable material and used in many different ways, therefore, its reintroduction in the productive process reveals its importance in the economic and environmental fields. The general goal of this present study is to evaluate the environmental impact of the life cycle of the selective collection system of plastic in the screening centers of the city of João Pessoa, Paraíba – Brazil, in the period between 2005 to 2015. The environmental analysis of the selective waste collection made use of the tool Life Cycle Analysis (LCA) which processed input data regarding the quantitative aspect of plastic collected, water consumption, energy and diesel with the aid of SimaPro 8.01 software. The obtained results reveal that the eutrophication and the reduction of the ozone layer are not compensated by the net benefits from the selective waste collection, even if not significant, being the regular selective waste collection the main impacting stage identified. The acidification, the global warming and the photochemical oxidation resulted in categories that compensate for the net benefits of selective waste collection, where recycling is the main compensatory step. Thus, the recycling should be made with a larger amount of plastic, in order to allocate properly the waste of this type and reduce the environmental impacts from the selective waste collection system as a whole.

Keywords: environmental impact, selective collection, solid waste management, *Life Cycle Analysis (LCA)*.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

ABORDAGEM SOBRE O COMPORTAMENTO DO IQA A PARTIR DA DEGRADAÇÃO DOS RECURSOS HÍDRICOS NA AMAZÔNIA

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APPROACH ON THE APPLICATION OF IQA IN THE AMAZON

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Abstract

The occupation and use of the soil by agricultural activities and of extractivism, for example alter the physical-chemical and biological processes in the natural systems. These changes can be evaluated through environmental quality monitoring, specifically by monitoring the quality of waters when occurring in a river basin, since the river is an integrator of the phenomena occurring in the watershed slopes. The article aims to understand the interactions between water quality and degradation in the Legal Amazon. The research was done in an exploratory way on the Water Quality Index (WQI) in the Legal Amazon, taking into account the main economic activities of the region that are linked to the deforestation process, where only the large hydrographic basins are monitored, limiting planning and management of its water resources. WQI is a practical and objective tool, as an initial indication of water quality and degradation. There are still few studies using the WQI on Amazon water quality, environmental agencies should establish control and inspection with the greatest possible rigor to strengthen the tripod of sustainable development (environment, society and economy), not allowing economic growth to be uncontrollably ahead of social and environmental development in Brazil.

Keywords: Legal Amazon, management of water resources, water quality.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

**VULNERABILIDADES NO ACESSO À ÁGUA PARA
CONSUMO HUMANO EM COMUNIDADES
RURAIS: ESTUDO DE CASO EM TRÊS LAGOAS,
AMARGOSA (BA)**

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**DRINKING WATER VULNERABILITIES IN RURAL
COMMUNITIES: CASE STUDY IN TRÊS LAGOAS,
AMARGOSA (BA)**

Recibido el 11 de abril de 2019; Aceptado el 6 de febrero de 2020

Abstract

Rural communities are the most affected in terms to quality water, due to the frequent use of alternative sources to supply the many uses. The reasons are the most diverse, from the absence of water supply system, as well the intermittent services, the lack of inspection and the lack of knowledge of consumer rights. A rural community in the municipality of Amargosa, in the state of Bahia, uses three modalities for obtaining water: public distribution network, cisterns and a lagoon ("the font"). This study revealed that the water quality provided by the public system complies with the potability standards established by the current legislation. However, the water quality of the cisterns and the lagoon ("fount") trespass the standards, and may pose a risk to the health of the residents. For this reason its use should be discouraged. Water analysis (Physical, Chemical and Bacteriological) were carried to prove this scenario, and Water Quality Indexes (WQI) were calculated to demonstrate the results.

Keywords: e-IQUAS, rural sanitation, water quality, water quality index.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

STRUCTURAL GROUTS WITH PARTIAL REPLACEMENT OF NATURAL AGGREGATE BY CERAMIC RESIDUES (CR)

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Abstract

This paper aims at investigating the behavior of structural grouts with partial replacement of the natural coarse aggregate by 50% of ceramic waste (CW). Five mixtures were dosed, varying in the addition of CW replacement, hydrated lime and superplasticizer. The fresh and hardened properties of each composite were analyzed through the slump test, compressive strength, capillary and total water absorption. Concerning the hardened state, grouts with CW addition and superplasticizer had the best results. Ceramic aggregates provided a 8% increase in compressive strength compared to the reference mixture, reaching almost 30 MPa for the matrices with CW and superplasticizer. Besides that, total and capillary water absorption were reduced by 2.5 times comparing to the references. However, the highest slump loss was obtained for grouts with CW and superplasticizer, despite their satisfactory consistency during the first 30 minutes, once that the chemical admixture loses its effect after this period. On the other hand, grouts with CW replacement and without superplasticizer maintained consistency for a 120 min and, even with a higher w/c ratio, their compressive strength reached 20 MPa, still above the 14 MPa required for structural grouts, according to ASTM C476. The addition of hydrated lime, in its turn, did not provide such an enhanced mechanical behavior to justify its use. Therefore, CW replacement of natural coarse aggregate is suitable to produce structural grouts.

Keywords: chemical conditioning, dewatering, geotextile fabric, experimental design, ETA residue.

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REVISTA AIDIS

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

USO DA METODOLOGIA DE SUPERFICIE DE RESPOSTA PARA AVALIAÇÃO DO DESAGUAMENTO DE RESÍDUOS DE ESTAÇÃO DE TRATAMENTO DE ÁGUA EM FILTRAÇÃO GEOTÊXTIL

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USE OF THE RESPONSE SURFACE METHODOLOGY FOR THE EVALUATION OF THE DEWATERING OF WASTE OF WATER TREATMENT STATION IN GEOTEXTILE FILTRATION

Recibido el 3 de mayo de 2019; Aceptado el 4 de mayo 2020

Abstract

Despite the growing concern with environmental impact, many water treatment plants in Brazil still do not have mechanisms to ensure the correct management of the waste generated in their treatment process. It is a residue with low solids content and with challenges regarding its management, final disposal or use. Confinement systems in geotextile tubes have been applied for this purpose in recent years, but it is still necessary to expand knowledge about its operation. Therefore, the objective of this study was to evaluate the effect of the variables in the process of ETA residue dewatering through the planning of experiments and process optimization. The study was divided into two stages: characterization of the waste treatment system, collection, preparation and characterization of waste from the ETA 006 water treatment plant (Palmas - TO) and bench trials with geotextile fabric. The results showed that the initial suspended total solids concentration (SST) of the residue and the dosage of chemical conditioning, in this specific case being the cationic polymer, influenced the amount of material retained by the geotextile tissue and the time of Dewatering. It was also observed that the studied SST concentration scale in the residue and chemical conditioning dosage were effective since the results were statistically significant. The results of the experimental planning showed that in the bench tests the geotextile with an opening of 200 μm weft (GT1) had better performance in the removal of filtrate turbidity and dewatering time compared with the results obtained with the geotextile with weft opening of 400 μm .

Keywords: chemical conditioning, dewatering, geotextile fabric, experimental design, ETA residue.

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REVISTA AIDIS

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Investigación, desarrollo y práctica

MEJORA DE LA CALIDAD DEL AGUA DE UN LAGO URBANO UTILIZANDO UN PROCESO DE COAGULACIÓN-FLOCULACIÓN

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URBAN LAKE WATER QUALITY IMPROVEMENT USING A COAGULATION-FLOCCULATION PROCESS

Recibido el 8 de mayo de 2019; Aceptado el 11 de mayo de 2020

Abstract

The urban lake studied is located west of Mexico City. The eutrophication problem of the lake worsened and the lake presented some hypertrophy symptoms due to its shallowness, limited flow, lack of stratification, unbalanced nutrient regimes, unbalance oxygen, and very high productivity, taking chlorophyll a concentration as parameter. Therefore, from 2015 up to now, the IMTA (Mexican Institute of Water Technology, for its Spanish acronym) has been monitoring the water quality of the lake and in March of 2016, a pilot coagulation-flocculation plant was installed for the removal of algae. The plant was fed with water from the lakes and the wastewater was returned to them. The results obtained were: the pH and the temperature did not vary greatly during this period. Nevertheless, a strong improvement was observed in the water quality of the lakes by an increase of transparency and a considerable decrease in turbidity and in the levels of chlorophyll a. It is important to mention that the concentrations of total Nitrogen and total Phosphorus also decreased. Finally, the evaluation of Aluminum and the return of the water to the lakes after the coagulation-flocculation process, did not affect the results. The conditions of hypertrophy remained, but the water treatment gave a better aspect to the lakes and the *Microcystis spp.* blooms were controlled, as well as the bad smell.

Keywords: water quality, chlorophyll, eutrophic, hypertrophy, nutrients.

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REVISTA AIDIS

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

REGIONALIZAÇÃO PARA A GESTÃO INTEGRADA DOS RESÍDUOS SÓLIDOS URBANOS: AVANÇOS E DESAFIOS PARA A SUSTENTABILIDADE EM CONSÓRCIOS PÚBLICOS OPERANTES NO BRASIL E NA ARGENTINA

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REGIONALIZATION FOR THE INTEGRATED MANAGEMENT OF URBAN SOLID WASTE: ADVANCES AND CHALLENGES FOR SUSTAINABILITY IN PUBLIC CONSORTIA OPERATING IN BRAZIL AND ARGENTINA

Recibido el 17 de mayo de 2019; Aceptado el 19 de diciembre de 2019

Abstract

In Latin American countries, the current management models adopted by municipalities, especially those of small size, with their individualized performance, have presented difficulties to promote the adequate management of Urban Solid Waste (USW). In Brazil and Argentina, despite improvements achieved through the implementation of the National Strategies and Policies, dumps and controlled landfills are present in most of their municipalities, corresponding to 41% and 49% of the volume collected, respectively (ABRELPE, 2016; MAyDS, 2016). With a view to achieving economies of scale and minimizing environmental impacts, the regionalization of waste management through the formation of inter-municipal consortia is encouraged in both countries. In Brazil, by the National Solid Waste Policy, Law 12305/2010 and, in Argentina by National Law 25916/2004 and National Strategy for Integrated Management of Urban Solid Waste 2005. The study aimed to analyze USW management in two intermunicipal consortia operating in the treatment and final waste disposal in Brazil and Argentina, evaluating the factors that lead to the different advances and challenges for sustainability in their municipalities. In order to do this, face-to-face interviews were carried out with the managers of the consortia and questionnaires were applied to municipal managers, using the guidelines of environmental regulations and performance indicators for data analysis. The results revealed that the consortia have solved the problems of inadequate disposal of USW through the sharing of regional landfills. However, its municipalities still face challenges in achieving sustainability in waste management, especially in the environmental, technological and social dimensions.

Keywords: public consortia, integrated urban solid waste management, regionalization, sustainability

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

ANÁLISIS DE LA DISPOSICIÓN DE LOS DESECHOS SÓLIDOS Y GENERACION DE BIOGAS EN EL RELLENO SANITARIO DE AMBATO, ECUADOR

* Bertha Elizabeth Ibarra-López¹
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Andrés de la Rosa²

ANALYSIS OF SOLID WASTE DISPOSAL AND BIOGAS GENERATION IN THE SANITARY LANDFILL OF AMBATO, ECUADOR

Recibido el 19 de mayo de 2019; Aceptado el 6 de febrero de 2020

Abstract

Urban solid waste presents a high environmental problem due to the products that are generated from its decomposition such as landfill gas (biogas) and leachate. Ecuador is a country with low average income, and it is estimated that by 2025 the generation of urban solid waste (MSW) will be 18,041 tons / day. Ambato is a district located in the province of Tungurahua and is characterized for being an agricultural sector. The present study is focused on analyzing the disposal of urban solid waste and the generation of biogas at different areas of the landfill. The Landfill of Ambato receives 120 tons/day of solid waste that contains 65% of organic waste. This sanitary landfill began its operation in 2006 and has an evacuation system for Biogas and leachate. For the present study, the landfill was divided in eight zones (A-H). Representative samples of landfill (buried waste) and biogas were taken from each zone to carry out laboratory analysis. The tests performed on soil samples of landfill were pH, organic matter, humidity and landfill gas (LFG) was characterized. The results of this study demonstrate that zone C contains the highest amount of methane and soil (buried waste) has a basic pH. The district of Ambato is an agricultural area, it has a high amount of organic waste. To improve methane generation a better technical management of the disposal solid waste is suggested. Improve soil (buried waste) compaction and moisture is suggested at zones (C-H).

Keywords: Ecuador, landfill, methane, organic matter.

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Investigación, desarrollo y práctica.

POPULATION SUPPORT FOR MAKING AN URBAN AREA AND ITS TRANSPORT SYSTEM RESILIENT AGAINST FLOODING

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Recibido el 24 de mayo de 2019; Aceptado el 4 de mayo de 2020

Abstract

The main objective of this research was to evaluate the population's support for a project to make resilient an urban area and local transportation system that are subject to flooding. To develop the study, a conceptual project was created that represented a solution to avoid flooding in the aforementioned area. This conceptual project was presented to a group of interviewees for their appraisal. A multiple choice questionnaire was utilized to capture the interviewees' perceptions about the proposal, as well as their opinions about the possibility of financially supporting the project. For this specific case study, the results indicate that the citizens would financially support the project. Yet, this support would be primarily in the form of volunteer work that would need to be converted into monetary resources. Beyond this, the interviewees were able to express their opinions and concerns about the proposal which was presented in the form of a conceptual project.

Keywords: resilient; flooding; urban area; transport system.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

CARACTERIZACIÓN DE RESIDUOS DE MACRÓFITAS ACUÁTICAS PARA LA PRODUCCIÓN DE COMPOST

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CHARACTERIZATION OF AQUATIC MACROPHYTES RESIDUES FOR COMPOST PRODUCTION

Recibido el 28 de mayo de 2019; Aceptado el 4 de mayo de 2020

Abstract

Around the world aquatic plants are considered weeds because they cause serious inconveniences for navigation, fishing and recreational tourism activities; however, there is evidence that can be used in the production of fertilizers, as food for livestock or in the decontamination of water, among others. In Pellegrini Lake (Río Negro, Argentina 39°LS) the proliferation of macrophytes due to the high nutrient contents of water, deserves the attention of the inhabitants, authorities and researchers. The objective of the work was to generate qualitative and quantitative information on the quantity and characteristics of plant residues coming from the cleaning of Pellegrini lake coasts for the production of compost and to submit the material to the composting process in a mixture of 60% remains of plants aquatic and 40% of chicken manure. The results showed that it is a material with good structuring properties and that it is necessary to continue evaluating in mixtures with other materials, but that it is necessary to deepen the studies on the presence of heavy metals in the vegetable remains prior to their use in agricultural activities.

Keywords: aquatic plants, compost, Pellegrini Lake.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

AVALIAÇÃO DA COLETA SELETIVA NO MUNICÍPIO DE BELO HORIZONTE, BRASIL

Cláudia Maria Campos de Almeida ¹
* Marcos Paulo Gomes Mol ²

EVALUATION OF THE SELECTIVE COLLECTION IN BELO HORIZONTE CITY, BRAZIL

Recibido el 28 de mayo de 2019; Aceptado el 12 de mayo de 2020

Abstract

Started in the 90's, the selective collection in Belo Horizonte city (Brazil) became a reference for other Brazilian cities. The ASMARE association, first selective collection association in the city, was introduced by the city hall in partnership with the waste collectors. The aim of this paper is to present an evaluation of the selective collection in Belo Horizonte city, highlighting the advances and setbacks that have occurred along the time and addressing challenges to be faced by the city in order to comply with the legislation goals. The National Sanitation Information System (SNIS) database was analyzed comparing selective collection in Belo Horizonte, Minas Gerais and other Brazilian municipalities, by statistical calculations. Results confirmed the stagnation condition of the selective collection program in Belo Horizonte city, although recorded financial expenses with waste management higher than the majority of Minas Gerais and Brazilian cities. It was concluded that despite the important historical trajectory of the studied municipality related to the selective collection implementation and the relevant financial investment, the effective results are worse than expected.

Keywords: selective collection, waste pickers, recyclable materials, waste management, Brazil.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

CORRELAÇÃO ENTRE INDICADORES DE RESÍDUOS SÓLIDOS DOMICILIARES EM RECIFE, BRASIL

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CORRELATION BETWEEN HOUSEHOLDE SOLID WASTE INDICATORS IN RECIFE, BRAZIL

Recibido el 30 de mayo de 2019; Aceptado el 28 de octubre de 2019

Abstract

A search for waste management solutions is an ongoing challenge for municipal managers. Given the rising scenario of the generation of these materials, especially in urban areas, the need to create an integrated, participatory, viable management model that is appropriate to the reality of the municipality becomes indispensable. In this sense, the in-depth study of indicators related to the management of waste is presented as the basis for a proposal of management models that meet the socioeconomic and environmental characteristics of the destination region. This paper studies the correlation of four indicators: population, income, generation and gravimetric composition, in 31 sectors of household waste collection in the city of Recife, through Principal Component Analysis, looking for correlation analysis and listing the indicators, defined by the reality of the sectors. The results show a positive correlation between income and per capita generation of household hazardous waste, especially in the upper class and commercial economy areas of the city. In addition, it was found that population data establish a negative correlation pattern with solid waste generation. The identification of the most influential indicators in the auxiliary collection sectors or municipal manager, in the elaboration of sectoral models of waste management that seek or in the understanding of the socioeconomic particularities.

Keywords: solid waste management, collection sectors, indicators, principal component analysis, multivariate analysis.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

REAPROVEITAMENTO E VALORIZAÇÃO DE RESÍDUOS DE PODAS URBANAS – AVALIAÇÃO EXPERIMENTAL

RECOVERY AND VALORIZATION OF URBAN PRUNING WASTE – EXPERIMENTAL EVALUATION

* Miriam de Fátima Carvalho ¹

Juan Carlos Rossi Alva ²

Maria Carolina de Paiva Costa ³

Felipe Guimarães Souza ²

Márcio José Pinheiro Ramos da Silva ⁴

Tamara Ribeiro Castro ²

Recibido el 10 de junio de 2019; Aceptado el 14 de septiembre de 2020

Abstract

This article presents and discusses monitoring data from composting process of urban organic waste mixtures (pruning: P, fruit and vegetables: FV and animal bedding: CM), aiming to recycle it and use the compost in parks and garden areas as an alternative for the sustainable management of this specific waste. Small open-air piles (between 210 and 730 kg) of organic waste mixtures in three different proportions were monitored two times of the year (November to April and May to September). The rainfall index, the piles temperature and the environment were monitored daily for 150 days, while the turning occurred twice a week during the period, with adjustments of the moisture content. Physical, chemical and bacteriological analyses (as pH, inert, organic matter, carbon, nitrogen, C:N ratio, metal concentration and the presence of pathogens) were carried out on the mixtures on the first and last monitoring days. Both monitoring periods presented similar environmental conditions, which allows us to presume that the lower temperatures achieved in the piles studied from May to September (between 30° to 50°C) and the higher C:N ratios obtained from the compost at the end of the process (between 16:1 to 12:1) were related to the smaller pile volumes, which causes heat loss to the environment, making decomposition harder. The organic compost from the different studied mixtures attend partially with the specifications of Class C compost specified by the Brazilian Ministry MAPA, because presented same bacteria that compromise its use in agriculture, however can be used in urban green areas and in recovery degraded land.

Keywords: composting, waste management, organic waste.

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REVISTA AIDIS

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COMPLEXAÇÃO DE FERRO E MANGANÊS EM PRESENÇA DE ORTO –POLIFOSFATO PARA OTIMIZAÇÃO DE TRATAMENTO DE ÁGUA DE ABASTECIMENTO: ESTUDO DE CASO

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Valderi Duarte Leite ²
Wilton Silva Lopes ²

COMPLEXATION OF IRON AND MANGANESE IN THE PRESENCE OF ORTO - POLYPHOSPHATE FOR OPTIMIZATION OF SUPPLY WATER TREATMENT: CASE STUDY

Recibido el 20 de mayo de 2020; Aceptado el 12 de septiembre de 2020

Abstract

This work presents a study on the application of orthopolyphosphate (O-Poly-P) for complexing iron (II) and manganese (II) in conventional surface water treatment. In Jar Test equipment, conventional treatment stages were simulated comprehending coagulation / flocculation and decantation, followed by 0.45µm filtering and chlorination with sodium dichloroisocyanurate. Under optimized conditions (100 mg / L of Al₂SO₄ and 8.33 mg / L of CaO) 95.2% of apparent color, 96.2% of turbidity, 98% of iron and 99% of manganese were removed. However, the remaining iron and manganese ions were oxidized in the chlorination stage, giving the water a yellowish color and raising the apparent color, which did not meet the potability standards. A Box-Behnken 2³ design was performed to evaluate the application of O-Poli-P before the disinfection step with sodium dichloroisocyanurate. The control parameters were the dosage of Al₂SO₄ and the dosage of O-Poli-P. The response parameters were apparent color and turbidity. Response surface and ANOVA were used to discuss the results. It was found that the concentration of O-poly-P has a greater influence on color and turbidity than the concentration of Al₂SO₄. The parabolic profile of the response surface indicated that there is an optimal concentration of O-poly-P in which there is greater removal of the apparent color. Apparent color in potable levels was obtained in the treatment with O-poly-P 250 µg / L and Al₂SO₄ 80 mg / L, which resulted in the removal of 96% of the apparent color, 95% of turbidity, 98% of iron and 99% of manganese.

Keywords: complexation of metals, iron, maganese, orthopolyphosphate, water treatment.

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REVISTA AIDIS

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Investigación, desarrollo y práctica.

WASTEWATER-BASED EPIDEMIOLOGY AS AN ALLY IN THE FIGHT AGAINST THE COVID-19: A BRIEF REVIEW

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Tallita Cruz Lopes Tavares ¹

Recibido el 24 de septiembre de 2020; Aceptado el 4 de diciembre de 2020

Abstract

Several researchers have detected the viral genome of SARS-CoV-2 in the stools of people (symptomatic or not) diagnosed with coronavirus disease-2019 (COVID-19). In domestic wastewater, this concentration can be between 19 and 5.5×10^6 viral genomes per liter of wastewater. Wastewater-based epidemiology (WBE) starts from the premise that it is possible to estimate the number of people infected by the new coronavirus within a given population group, by analyzing the amount of viral genome present in the wastewater produced by these people. This paper presents the procedures to estimate the number of COVID-19 cases from raw wastewater samples, discusses the main aspects that involve the WBE assay and presents a discussion based on the case studies applied to COVID-19 in some countries. Finally, there is a final discussion about the current situation and the main challenges for WBE to be applied efficiently for COVID-19, as an alternative to massive human testing, especially for developing and underdeveloped countries.

Keywords: novel coronavirus, SARS-CoV-2, sewage, viral genome, wastewater sampling.

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