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Temática y alcance

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.

El enfoque es multidisciplinario, buscando contribuir en forma directa a la generación de conocimiento, al desarrollo de tecnologías y a un mejor desempeño profesional. Entre los temas cubiertos por la revista están los siguientes: agua potable, calidad de agua, aguas residuales, residuos sólidos, energía, contaminación, reciclaje, cambio climático, salud ambiental, nuevas tecnologías, ética, educación, legislación y política ambiental, gestión ambiental, sostenibilidad y participación social, entre otros.

Cada edición muestra los trabajos que derivan del arbitraje académico estricto de carácter internacional. También se publican números especiales de temas particulares que fueron presentados en los diversos Congresos Interamericanos realizados por la Asociación Interamericana de Ingeniería Sanitaria y Ambiental (AIDIS) y que en forma adicional fueron sometidos al proceso de revisión interno de la revista.

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Editorial

Con mucho gusto presentamos el segundo número de 2023 de la Revista AIDIS de Ingeniería y Ciencias Ambientales. Extendemos una felicitación a Ian Rocha de Almeida y colaboradores ya que su artículo ***Carbendazim adsorption on granular activated carbon of coconut shell: optimization and thermodynamics*** es la Selección del Editor de este número. Este trabajo fue realizado en el Instituto de Pesquisas Hidráulicas de la Universidade Federal do Rio Grande do Sul, Brasil. Enhorabuena a los autores y a la institución por el trabajo realizado.

Como siempre, invitamos a toda la comunidad Iberoamericana especializada en Ingeniería y Ciencias Ambientales a que continúen sometiendo sus trabajos a Revista AIDIS. Los idiomas oficiales de publicación son inglés, español y portugués. El Equipo Editorial trabaja con gran entusiasmo para mantener altos estándares de calidad y fluidez en los procesos de revisión y publicación de los artículos. Actualmente, el tiempo promedio entre la primera revisión y la aceptación de un artículo sometido a la Revista AIDIS es de 6 semanas. Seguiremos trabajando para consolidar el prestigio de la Revista AIDIS en la comunidad Iberoamericana como una publicación de alta calidad y como referente internacional en el área de Ingeniería y Ciencias Ambientales.

Guillermo Quijano
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ELABORAÇÃO DE UM PLANO DIRETOR PARA LOGÍSTICA REVERSA DE EMBALAGENS VAZIAS DE AGROTÓXICOS PÓS-CONSUMO DO ESTADO DO TOCANTINS

* Luciane de Paula Machado [1]
Marcelo Mendes Pedroza [1]
Luciana Rezende Alves de Oliveira [2]

PREPARATION OF A MASTER PLAN FOR REVERSE LOGISTICS OF EMPTY POST CONSUMPTION PESTICIDE PACKAGING IN THE STATE OF TOCANTINS

Recibido el 10 de marzo de 2022. Aceptado el 28 de junio de 2022

Abstract

Concerns about pesticide packaging justify this work due to the lack of data on the management of empty post-consumer packaging, in addition to the importance of this issue today and the need to present solutions on improving reverse logistics. The main objective of the study is the elaboration of the master plan for the reverse logistics of empty packaging of post-consumer pesticides in the state of Tocantins. The research development methodology included theoretical basis and field work to collect qualitative data, carried out through bibliographic research on the subject, the SWOT matrix tool was applied to identify and understand the strengths and weaknesses of reverse logistics of empty packaging of pesticides in the state of Tocantins. A diagnosis of the situation of agrosilvopastoral residues (empty post-consumer pesticide containers) in Brazil and in the State of Tocantins was presented, covering the set of types of residues according to the National Solid Waste Policy, classified according to their origin and dangerousness. A diagnosis was carried out for the implementation of guidelines, and objectives director of waste management of empty post-consumer pesticide packaging, which were guided as scenarios and developed through SWOT analysis. As a result, a planning for the development of the master plan was obtained, taking the State of Tocantins as a model, but it can be applied in other Brazilian states since the political and national law is for the whole country, taking care that each place has its particularity and problems in the execution of reverse logistics of empty post-consumer pesticide containers.

Keywords: pesticides, reverse logistics, SWOT matrix, national solid waste policy, planning strategic.

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EVALUATION OF THE PROPERTIES OF BIOCHAR OBTAINED FROM RICE HUSK FOR ITS APPLICATION IN AGRICULTURAL SOILS

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Regina Célia Espinosa Modolo [1,2]
Emanuele Caroline Araujo dos Santos [1]
Jenifer Lima da Silva [3]
Felipe Aloísio Sachetti [4]
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Feliciane Andrade Brehm [1]
Carlos Alberto Mendes Moraes [1,2]

Recibido el 12 de abril de 2022. Aceptado el 18 de octubre de 2022

Abstract

The increasing world population boosted the demand for basic needs such as energy, water, and food. In turn, agricultural production has increased, generating a large amount of agro-industrial waste every year. Globally, Brazil is the seventh-largest rice producer, and the State of Rio Grande do Sul is responsible for 70% of the rice production in Brazil. Rice husks are composed of organic compounds (cellulose, hemicellulose, lignin, and extractives) and inorganic elements that include potassium, calcium, magnesium, and sulfur. These inorganic elements are essential nutrients in the soil. Since natural degradation is slow due to the aromaticity of lignin, rice husk (RH) waste accumulates and poses an environmental threat, causing air and water pollution. In this context, in order to return the biochar to the soil, the properties of rice husk and rice husk biochar were evaluated. Parameters such as pH, true density, bulk density, porosity, identification of the composition and concentration of the elements, analysis of the functional groups, total carbon (TC), and cation exchange capacity (CEC) were performed on RH biochar samples. These samples were produced in a laboratory-scale pyrolysis rig, under a con-trolled atmosphere of Nitrogen (N), using three peak temperatures (350 °C, 450 °C, and 550 °C) and three soak times (30, 60, and 120 min).Based on the results obtained in the characterization analyses of the biochar, as well as the yield values found, it is concluded that the best pyrolysis temperature for the production of biochar from rice husks, for application in soils, is 550 °C.

Keywords: rice husk, agro-industrial waste, biochar, agricultural soils.

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AVALIAÇÃO DO DESEMPENHO DE UMA ESTAÇÃO DE TRATAMENTO DE ÁGUA DE CICLO COMPLETO LOCALIZADA NO MUNICÍPIO DE MARINGÁ-PR

* Camila Hamano Toledo [1]
Cláudia Telles Benatti [1]

PERFORMANCE EVALUATION OF A FULL CYCLE WATER TREATMENT PLANT LOCATED IN THE MUNICIPALITY OF MARINGÁ-PR

Recibido el 12 de mayo de 2022. Aceptado el 8 de mayo de 2023

Abstract

The full cycle water treatment plants (WTP's) perform the purification of natural waters through the stages of coagulation, flocculation, decantation, filtration, disinfection, fluoridation and pH correction. In order to guarantee the provision of good quality treated water, it is necessary to evaluate the performance of the treatment stages to ensure the efficiency of each one of them. With this in mind, the present paper aims to evaluate the performance of a WTP located in the interior of Paraná through indicators based on the quality of the raw, coagulated, decanted, filtered and treated water, on the construction and operational characteristics of the treatment units of the WTP and on the compliance with the technical standard NBR 12216/92, the legislations CONAMA Resolution n° 357/5 and Ordinance n° 888/21 and the considerations/recommendations made by the literature. Despite the quality of the raw water being compromised, it was found that the quality of the treated water is in accordance with the potability standard established by Ordinance n° 888/21. However, constructive and operational aspects of the WTP to be improved were identified. Due to this, the present paper shows subsidies that aim to improve the efficiency of the WTP and enable the sustainability of its water treatment system.

Keywords: water treatment plants, performance, efficiency, indicators, sustainability.

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UTILIZAÇÃO AGRÍCOLA DE BIOSSÓLIDOS: ANÁLISE CRÍTICA DA RESOLUÇÃO CONAMA N° 498/2020

Lucas Jediael de Souza Paes [1]
Jussara Ferreira-Santos [1]
* Edgard Henrique Oliveira Dias [1]

USE OF BIOSOLIDS IN AGRICULTURE: CRITICAL ANALYSIS OF THE RESOLUTION CONAMA N° 498/2020

Recibido el 1 de junio de 2022. Aceptado el 18 de octubre de 2022

Abstract

This document presents a critical-comparative analysis of the current Brazilian Resolution CONAMA n° 498/2020 in relation to the previous Resolution CONAMA n° 375/2006 and emblematic international regulatory documents, namely Norm 503 (USA) and Sludge Regulations (United Kingdom). The main changes in the Resolution CONAMA n° 498/2020 refers to a certain 'flexibility' regarding microbiological standards (laboratory monitoring and/or operational control), as well as uses and restrictions of biosolids Classes A and B. Additionally, more detailed information about sewage sludge treatment (production of biosolids) and operating parameters of Process to Significantly Reduce Pathogens (PRSP; Class B biosolids) and Process to Further Reduce Pathogens (PFRP; Class A biosolids), as well as the implementation of Classes I and II biosolids regarding chemical parameters. Despite the changes, Resolution CONAMA n° 498/2020 can be considered safe in terms of public health, essentially because it was, in theory, based on the concept of double barrier protection and the quantitative microbial risk assessment (QMRA) approach. Therefore, it is believed that the current legislation, along with public acts and policies as well as other legal instruments to encourage the use of biosolids in agriculture, can leverage the production and agricultural application of biosolids in Brazil. It is important to highlight, however, the relevance of future improvements (sewage sludge treatment; biosolids quality criteria; biosolid uses and restrictions) through research and scientific methodologies that prove and support decision-making processes.

Keywords: biosolids, uses and restrictions, double protective barrier, agricultural application, risk assessment.

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CARBENDAZIM ADSORPTION ON GRANULAR ACTIVATED CARBON OF COCONUT SHELL: OPTIMIZATION AND THERMODYNAMICS

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Salatiel Wohlmuth da Silva [1]
Lígia Conceição Tavares [1]
Antônio Domingues Benetti [1]

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Abstract

The adsorption of the fungicide Carbendazim (CBZ) on granular activated carbon (GAC) of coconut shell was investigated through batch tests in deionized water. The most favorable conditions for the adsorption of CBZ were examined through the variation of the mass of GAC, temperature, and contact time. The Response Surface Methodology (RSM) was applied, seeking the best adsorption condition to optimize future tests. A thermodynamic analysis was carried out using the Van't Hoff method. The tests with the dosage of 10 mg of GAC and temperatures of 25º C and 30º C showed higher adsorption of the fungicide. The Freundlich isotherm adjusted best to the adsorption of the compound. The Freundlich intensity parameter had a result that contrasted with the value of ΔG regarding a spontaneous change. Physisorption predominates the adsorption of CBZ on GAC. It is an exothermic and spontaneous process that reduces the degree of disorder of the adsorbent/solution interface.

Keywords: carbendazim adsorption, granular activated carbon, adsorption optimization, response surface methodology, adsorption thermodynamics.

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ASPECTOS ASSOCIADOS À PROMOÇÃO DA SUSTENTABILIDADE NA INDÚSTRIA TÊXTIL: ESTUDO BIBLIOMÉTRICO E ANÁLISE DE TENDÊNCIAS

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ASPECTS ASSOCIATED WITH THE PROMOTION OF SUSTAINABILITY IN THE TEXTILE INDUSTRY: A BIBLIOMETRIC STUDY AND TREND ANALYSIS

Recibido el 6 de julio de 2022. Aceptado el 18 de enero de 2023

Abstract

The environmental impacts associated with the textile industry have made sustainability perspectives evident in studies related to the subject, including aspects such as eco-efficiency, cleaner production and water reuse. With the growth of these studies, it becomes necessary to assess trends in research development, and bibliometrics can be a relevant tool for this analysis. Thus, this study aimed to identify the factors that have contributed to the development of sustainability in the textile industry, including aspects related to eco-efficiency, cleaner production and water reuse. For this, a bibliometric analysis was carried out, as well as a complementary systematic analysis, for the evaluation of the studies. With this, it was analyzed that the number of publications related to the theme has been increasing in recent years, highlighting the relevance of discussions on the association between the aforementioned factors and their application in the textile sector. It was also understood that aspects such as cleaner production and reuse of water are extremely important and must be dealt with in depth in studies on sustainability. Therefore, this evaluation allowed us to understand that cleaner production is essential for sustainable management in the textile chain and that reuse technologies are necessary to enable quality of treated textile wastewater and allow reuse for other purposes in the industry itself. With the results obtained, it is believed that the findings presented here provide more perspectives for an understanding of the development of research in relation to the subject.

Keywords: eco-efficiency, cleaner production, water reuse.

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RELAÇÃO ENTRE INDICADORES DE SANEAMENTO BÁSICO E SOCIOECONÔMICOS E A OCORRÊNCIA DE DOENÇAS DIARREICAS AGUDAS NOS ESTADOS DA AMAZÔNIA ORIENTAL

* Ana Carolina Moraes Reis [1]
João Pedro Machado Duarte [1]
Enilde Santos de Aguiar [1]
Dênis José Cardoso Gomes [1]
Hélio Raymundo Ferreira Filho [1]

RELATIONSHIP BETWEEN BASIC AND SOCIOECONOMIC SANITATION INDICATORS AND THE OCCURRENCE OF ACUTE DIARRHEA DISEASES IN THE EASTERN AMAZON STATES

Recibido el 29 de julio de 2022. Aceptado el 25 de enero de 2023

Abstract

The occurrence of acute diarrheal diseases, in addition to being an important public health issue, is related to several factors, among which basic sanitation conditions can be highlighted, as well as socioeconomic aspects of the locations where they occur. The objective of this article is to carry out a comparative study between basic sanitation and socioeconomic indicators and the incidence of acute diarrheal diseases in the states of the Brazilian Eastern Amazon. The data used are of a secondary nature, obtained from bibliographic and documentary research, between the years 2010 to 2019, in official databases, using descriptive statistics and correlation analysis, for the treatment of data obtained, Minitab software 18 was used. Among the annual averages of occurrences of acute diarrheal diseases, the states of Pará and Maranhão stand out, which presented averages of approximately 217,000 and 128,500 cases, respectively. Sanitary sewage was highest for the state of Mato Grosso, with 26%, followed by Tocantins with 19%, while Amapá and Pará had the lowest service provision indicators, both with 5% of service for the period. This context also did not present significant changes in the last 10 years, reflecting in the maintenance and little variation in the occurrence of acute diarrheal diseases. Sanitation indicators do not always follow population growth in quantity and quality, reflecting in the increase in the occurrence of ADDs, which are considered preventable through adequate sanitary measures.

Keywords: environmental sanitation, enteroparasitic diseases, public health.

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AQUAPONICS IN BRAZIL: REVIEW AND SURVEY ON WASTE MANAGEMENT PRACTICES

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* Marco Aurélio Soares de Castro [1]

Recibido el 2 de agosto de 2022. Aceptado el 17 de abril de 2023

Abstract

Aquaponics is a food production technique that may be applied in the context of urban agriculture to help achieve food security and promote sustainable agriculture and production patterns, among other Sustainable Development Goals. Brazilian population is large and highly concentrated in urban areas and might benefit from this technique. Similar to any other production activity, aquaponic systems generate wastes that must be properly managed, but until now no study focused on waste generated on such systems or on management practices adopted by Brazilian producers; the goal of this article was to address both of these gaps. A systematic review identified waste streams generated on aquaponics, while management practices were seldom mentioned and addressed. A survey on producers located in 17 of the 27 Brazilian federal units helped confirm sludge, packaging waste, dead fish and unusable plant fractions as typical waste streams. It also identified a lack of concern for a more in-depth assessment of such streams to improve management practices, which tended to gravitate toward adequate and inadequate disposal. Finally, the article proposes management practices for each waste stream, drawing from strategies foreseen in Brazilian National Solid Waste Policy.

Keywords: aquaponic sludge; aquaponics; sustainable agriculture; urban agriculture; waste management.

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GEOPOLÍMEROS POROSOS SÃO ADSORVENTES ALTERNATIVOS PARA A ADSORÇÃO DE METAIS PESADOS? ANÁLISE DAS RECENTES DESCOBERTAS

Jamile Sheron Marcon [1]
Gabriel André Tochetto [2]
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ARE POROUS GEOPOLYMERS ALTERNATIVE ADSORBENTS FOR HEAVY METALS REMOVAL? ANALYSIS OF RECENT DISCOVERIES

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Abstract

Currently, greater attention has been given to the contamination of water resources by different categories of compounds, as this is an essential resource for life. In this way, the present work carried out a bibliographic study regarding the synthesis of geopolymers (GPs), through different materials and methodologies, with application to the adsorption of heavy metals, addressing the issue of modifications carried out in the synthesis of GPs, in order to obtain the potentiation of its adsorption characteristics. It was found that for the synthesis of GPs there is no standard, that is, a varied number of precursor materials, alkaline activators, curing times and temperatures can be used, with sealed containers or not, and choose different particle sizes for use in the adsorption process. Also, use can be made of pore-creating agents, or modifications performed during the synthesis of materials in order to attribute the desired characteristics to the GPs. The use of GPs as adsorbents with the objective of removing heavy metals, proved to be effective and with application perspectives for various metal ions (Ni, Pb, Cu, Hg, Cd, Cr, Zn, Cs).

Keywords: aluminosilicates, immobilization, review.

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ATERRO MUNICIPAL DE RESÍDUOS SÓLIDOS DE CARUARU: UM CASO DE ESTUDO SOBRE RETENÇÃO DE GASES NA CAMADA DE COBERTURA

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CARUARU MUNICIPAL SOLID WASTE LANDFILL: A CASE STUDY ON GASES RETENTION IN THE COVER LAYER

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Abstract

The landfills cover layers are responsible for isolating waste, reducing the infiltration of rainwater into the massif, and preventing the gases generated in the organic matter biodegradation process from reaching the atmosphere. This article presents the evaluation of gases retention in the cover layer of the Caruaru Municipal solid waste landfill, located in the northeast Brazil. The landfill activities were closed in March 2018. The cover layers were evaluation by geotechnical characterization of the soil (classification, granulometry, degree of compaction, moisture, degree of saturation, void index, and layer thickness). In the field, 20 static flow plate tests were performed to verify the amount the gas that reached the surface through the cover layer. The tests were carried out in 4 stages, at 5 different points selected according to the age of the waste deposited there (2, 4, 6, 8 and 10 years, respectively). Due to the low emissions indicated by plate tests, the generation of gases within the tailings mass was investigated through 20 pressure and concentration tests with the aid of the Pressure and Concentration Measuring Device (DMPC) and the emissions of gases were analyzed in 9 drains that were close to the points of the other field tests. According to the granulometric analysis of the material, 4 of the samples collected on the ground consisted of sandy materials (silty sand, clayey sand and well-graded sand) and 1 sample had sandy clay. The results of the void indexes were between 0.5 and 0.63, the degrees of saturation were between 64.4% and 90.6%, the moisture contents were between 17% and 20.3% and the degrees of compaction between 80% and 90%. The layer thickness was measured at 20 different points and the values varied between 0.80 and 1.35 m. Low concentrations of biogas were found through DMPC (0.1% to 7.6%). In most drains, low concentrations of the main greenhouse gases found in biogas (methane and carbon dioxide) were identified, however, in 2 drains high concentrations were measured (17.5% and 56%). At the end of the analysis, it was found that currently around 22.36% of gas emissions reach the atmosphere through the cover layer. These values must have been higher during the period of activity of the landfill, because, as observed, at some points there was no more generation of biogas.

Keywords: landfill, cover layer, gas flow, static flow plate, biogas.

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REMOÇÃO DE CO_2 DE BIOGÁS DE ATERRO SANITÁRIO EMPREGANDO COLUNA DE ABSORÇÃO COM SOLUÇÃO ALCALINA

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REMOVAL OF CO_2 FROM LANDFILL BIOGAS USING AN ABSORPTION COLUMN WITH ALKALINE SOLUTION

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Abstract

The research aimed to evaluate the removal of CO_2 from biogas from the sanitary landfill in the municipality of Palmas – Tocantins. The flow measurement (weekly and daily profile) of the biogas was carried out through a vertical drain located in one of the cells of the Landfill. LPG Building gas measurement operation was carried out through the biofuel carried out from a gas meter. The biogas purification tests were carried out using a spray tower scrubber, using calcium hydroxide solutions to remove CO_2. The variable concentration of the alkaline solution was evaluated during the biogas purification tests. Samples were collected and analyzed using chromatographic techniques, before and after the biofuel purification system. The biogas flow profile equal to 18 m^3/day indicates the possibility of application of this biofuel as an energy resource. During the tests of transformation of biogas into biomethane, using a washing column with alkaline solution, a methane content of 75% was obtained when calcium hydroxide solution with a concentration equal to 0.16 mol/L was used, which points to obtaining a better quality biofuel after a purification system, meeting the characteristics recommended by the National Petroleum Agency (ANP), for industrial application purposes.

Keywords: biofuels, biomethane, gas purification, renewable energy.

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O SANEAMENTO COMO MERCADORIA: UMA ANÁLISE DA LEI 14.026 E SUA APLICABILIDADE NO ESTADO DA PARAÍBA – BRASIL

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COMMERCIALIZATION OF SANITATION: AN ANALYSIS OF LAW 14.026 AND ITS APPLICABILITY IN THE STATE OF PARAÍBA – BRAZIL

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Abstract

The universalization of sanitation is an essential factor to guarantee people's quality of life. However, in Brazil, access to these services is limited by several factors. Law #14,026/20, enacted on July 15, 2020, became known as the New Legal Framework for Sanitation, and despite regulation being an important step to boost universalization, the new law stimulates commodification thinking by proposing privatization of services by creating blocks, so that neighboring municipalities participate in the same bidding and will have the services provided by the same company, which is the way found for private companies to envision profit in the development of sanitation services, since many municipalities, do not generate profit on invested capital. This is the case for more than 98% of the municipalities in the state of Paraíba. Thus, this work discusses the New Legal Framework for Sanitation on the logic that only democratic management with the contribution of public resources is capable of promoting the universalization of services. The work also presents an overview of sanitation in Paraíba and discusses the issue of Complementary Law #168/19. The conclusions show that the application of a reproductive model of inequality and socio-environmental injustice occurs in Brazil. Therefore, it is necessary to understand that in essential services that guarantee human dignity, the presence of a Democratic State of Law is essential to ensure that the entire population is served.

Keywords: social rights, environment, new legal framework for sanitation, basic sanitation.

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ANAEROBIC CO-DIGESTION OF MICROALGAE AND RESIDUAL GLYCEROL RECOVERED FROM BIODIESEL: EVALUATION OF PRETREATMENT AND COD/N RATIO

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Abstract

Anaerobic digestion can be a viable alternative for the destination of effluents from stabilization ponds rich in naturally produced microalgae, without the need for concentration processes, however, there are challenges related to the rigid cell wall of microalgae and the low carbon content in its composition, to be overcome. To improve these parameters, this study comparatively evaluated hydrolytic pretreatments in microalgae from effluents from stabilization ponds, aiming to hydrolyze the cell wall of these microorganisms, for co-digestion with residual glycerol from biodiesel. In this case, glycerol is a by-product with limited applicability, acting in this scenario as a carbon supplier, improving the C/N ratio, microalgae biodegradation and biomethane production. Effluents with microalgae submitted to thermal and ultrasonic hydrolysis (for 30 and 90 minutes) were tested to assess their potential in the production of methane-rich biogas, monitored by gauge measurements and gas chromatography, respectively, in co-digestion with residual glycerol from biodiesel. The heat treatment for 30 minutes showed more satisfactory results and was replicated in a benchtop anaerobic reactor (R2), in parallel with a reactor operating untreated microalgae (R1), in a continuous feed system. The effects of pretreatment and COD/N ratio were evaluated on organic matter removal and biomethane production. R2 showed the most satisfactory effect on COD removal, resulting in up to 90% COD removed, with a theoretical biogas production of 0.52 L g^{-1} COD removed. As for the methane content contained in biogas, R1 reached percentages of up to 84% against 73% in R2.

Keywords: biodiesel, biomethane, stabilization pond, microalgae.

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REVISTA AIDIS

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ASSESSMENT OF HYDROGEOCHEMISTRY AND GIS-BASED EVOLUTION OF GROUNDWATER QUALITY AND SALINITY IN THE SHALLOW AQUIFER OF SÃO JOSÉ DO NORTE, SOUTHERN BRAZIL

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Abstract

Water salinization changes the hydrogeochemistry, affects the quality and quantity of groundwater available for human consumption and its mitigation is time-consuming. A large brackish lagoon and the Atlantic Ocean surround the aquifer of the São José do Norte town (Brazil). Population and economic growth have been demanding more groundwater for domestic and agricultural purposes, stressing the aquifer. Despise the aquifer's social-economic relevance, potential threats on the groundwater have not yet been substantially investigated. The aims of this study were to analyze the hydrogeochemistry of the São José do Norte aquifer, focusing on the search for salinization indicators, and to assess the groundwater suitability for human drinking and irrigation purpose. Ionic ratios, Piper and USSL diagrams were applied, such as new methods, as Seawater Intrusion Groundwater Quality Index (GQI_{SWI}) and the Groundwater Quality Index for human consumption ($GWQI_{HC}$). The results showed that the groundwater is mostly calcium bicarbonate type and did not indicated salinization occurrence. The interior and the northern area had the highest ionic content and the lowest water quality values. Most of the samples contained at least one parameter above the maximum allowed concentration for drinking purpose according to water quality standards. High concentration of alkalinity, iron and hardness reduced the groundwater suitability for human consumption, requiring water treatment before ingestion.

Keywords: coastal assessment, saltwater intrusion, GQISWI, groundwater quality, GWQIHC.

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MONITORING OF CONTAMINATION OF URBAN SURFACE WATERS IN THE CITY OF CAMPO GRANDE/MS BY HORMONES 17β-ESTRADIOL AND 17α-ETHINYLESTRADIOL USING DISPERSIVE LIQUID-LIQUID MICROEXTRACTION AND HPLC-UV

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Abstract

Studies have shown that hormones have endocrine disrupting properties, which characterize them as potentially toxic to the aquatic environment. This study aims to monitor the water along Prosa Stream/Anhanduí River monthly, to evaluate its contamination by the hormones 17β-estradiol (E2) and 17α-ethinylestradiol (EE2). Dispersive liquid-liquid microextraction (DLLME) was used for analyte extraction, with acetone as a disperser solvent and carbon tetrachloride as the extraction solvent, followed by high-performance liquid chromatography with ultraviolet detector (HPLC-UV) as the analytical tool. The results of this application in natural samples indicated the presence of the natural hormone E2 in approximately 72% of the points evaluated, with its concentration values between 48 μg L^{-1} and 175 μg L^{-1}. In contrast, it was not possible to quantify the concentrations of synthetic hormone EE2, as these values were below the detection limit of the analytical method applied. Even though there is no national environmental legislation that limits amounts of hormones in surface water, these contaminations are significant, due to their already known toxicological potential. It was evident that along the river from its origin to the exit of the city there was the appearance and increase of the contamination of the waters by the hormone E2, thus it is clear that the urbanization around the rivers has become an environmental and health problem for providing the contamination of the aquatic environment.

Keywords: 17β-estradiol, 17α-ethinylestradiol, DLLME, endocrine disruptor, surface water.

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TÉCNICAS DE REMOÇÃO DE MICROPOLUENTES EMERGENTES PRESENTES NA ÁGUA: UMA REVISÃO SISTEMÁTICA

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TECHNIQUES FOR REMOVING EMERGING MICROPOLLUENTS IN WATER: A SYSTEMATIC REVIEW

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Abstract

Emerging micropollutants (MPE) are substances detected in the environment, be it water and soil, which can in no way alter these systems, in addition to human health. Water treatment processes framed as conventional are generally inefficient in removing contaminants. Thus, alternative technologies of effective removal for this treatment are sought. For this, a systematic review of the literature was carried out that aimed to show a perspective on the MPE considered elements of the studies, as well as applied treatment techniques and efficiencies achieved, based on three international data platforms, with selection of acceptance criteria and rejection based on the protocol under review. The study included the bibliographic portfolio composed of 35 primary articles, with citation of 109 MPE, belonging to 39 groups, exposed to 44 techniques aimed at treatment. As a result of the data, these were synthesized in an abacus. A significant diversity of active ingredients was observed, removed by multiple treatment techniques, requiring studies to incorporate techniques that will act associated with conventional treatment in a viable manner.

Keywords: microcontaminants, water treatment, endocrine disruptors, drugs, micropollutants abacus.

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COMPARISON OF CONTAMINANTS REMOVAL EFFICIENCIES IN WASTEWATER USING CONSTRUCTED WETLANDS OF SINGLE AND TWO STAGES

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Abstract

Constructed wetlands are green technologies, nature-based solutions, that use phytoremediation for the treatment of wastewater studied in domestic, industrial, and agricultural uses and products such as hydrocarbons and some emerging pollutants. The objective is to analyze the efficiency of the constructed wetlands for the removal of heavy metals, nutrients such as phosphorus, and nitrogen in wastewater treatment. This study presents the results of contaminant removal from two types of constructed wetlands; single-stage and two-stage, which determine their efficiency. The removal of COD, BOD, phosphorus, fats, nitrogen, solids and others, showed similar efficiencies for each plant, with removal ranges between 16% and 95% relative to each pollutant analyzed. As a complement, the concentration of heavy chromium VI, cadmium, and total iron were reduced and analized thlrough the UV-VIS spectrophotometric method, which from three absorbance measurements for each metal, with wavelengths of 540 nm, 228 nm, 8 nm, and 510 nm, respectively, efficiencies of 62% and 85% were found for chromium VI removal; 43% and 53% removal for cadmium; 37% and 53% removal for total iron, results according to single-stage and two-stage plants.

Keywords: heavy metals, phytoremediation, spectrophotometry, water contamination.

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DATA ENVELOPMENT ANALYSIS APPLIED TO SOLID WASTE MANAGEMENT IN THE 21ST CENTURY: A BIBLIOMETRIC ANALYSIS

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Abstract

The increase in solid waste generation and the necessity for more efficient management are issues of modern society. Nonetheless, its multifactorial nature makes this problem complex and searching for solutions not simple. In this way, this type of study requires tools that allow simultaneous incorporation of multiple variables. Data Envelopment Analysis (DEA) is a multivariate and non-parametric technique that analyzes a unit's efficiency by comparison. The bibliography indicates that this technique applied to solid waste management systems is already a reality. However, there has been no bibliometric reports on current and future research trends about the theme. Thus, this paper aims to fill this gap through a bibliometric analysis, using the literature from the Scopus database, considering articles from journals and conferences published until February 2022. The results indicate that this topic research began in the 21st century, with an expressive rise since 2016, highlighting the topic's relevance and potential for future research application. In addition, China, Spain, Italy, and the USA are the most productive countries, but cooperation is still weak. Hence, there is a potential to disseminate this research field and promote greater interinstitutional cooperation. Moreover, the findings reveal that DEA is an adequate tool to analyze solid waste management systems. Lastly, this study offers some future research suggestions, based on the results obtained through the bibliometric analysis.

Keywords: bibliometric analysis, data envelopment analysis, solid waste, waste management.

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