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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.

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AVALIAÇÃO DO TRATAMENTO FÍSICO-QUÍMICO DE EFLUENTE DA INDÚSTRIA TÊXTIL POR MEIO DE DIAGRAMAS DE COAGULAÇÃO

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Maria Eduarda Borges de Almeida [1]
Rosângela Gomes Tavares [1]
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EVALUATION OF THE PHYSICAL-CHEMICAL TREATMENT OF A TEXTILE INDUSTRY EFFLUENT THROUGH COAGULATION DIAGRAMS

Recibido el 24 de enero de 2023. Aceptado el 11 de septiembre de 2023

Abstract

The main environmental problem associated with textile industries is the produced effluent that is difficult to degrade. This effluent is composed of a mixture of dyes, metals, and other pollutants. When it is untreated and improperly disposed of in the environment, its toxicity can degrade ecosystems. The processes of coagulation, flocculation, and subsequent decantation are widely used in wastewater treatment in industrial textile systems. In this context, the purpose of this work was to compare the removal efficiency of physical-chemical parameters from textile effluent using the coagulants Aluminum Polychloride (PAC) and Aluminum Sulfate, in the coagulation/flocculation/decantation process in different pH variations. The characterization of the effluent was made through analysis of the pH parameters, turbidity, apparent color, total solids and chemical oxygen demand, according to the Standard Methods for Examination of Water and Wastewater protocol. The Jar Test was used for the simulation of the coagulation, flocculation, and decantation stages, and the Mini Tab 19 software for the elaboration of the coagulation diagrams. It was verified that the apparent color and turbidity parameters presented a reduction with the use of PAC, at a dosage of 75 mg/L for pH in the acid and near neutral ranges. Regarding total solids and Chemical Oxygen Demand (COD), it was observed difficulty in removing these parameters with the adopted technology.

Keywords: coagulants, textile effluent, aluminum polychloride, aluminum sulfate.

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BLOCKCHAIN IN REVERSE LOGISTICS FOR SOLID WASTE MANAGEMENT: A PROPOSAL

André Lima Alves [1]
Rodrigo Benedecte Munhoz [1]
Kumiko Oshio Kissimoto [2]
* Marcos Paulo Gomes Mol [3]
Max Filipe Silva Gonçalves [1,4]

Recibido el 9 de marzo de 2023. Aceptado el 1 de enero de 2024

Abstract

Despite the claim that blockchain will revolutionize business, existing research so far is limited regarding frameworks that categorize blockchain application potentials and their implications. In particular, the academic literature is not well-defined on how to adopt this technology for reverse logistics management. In response, this article uses a brief review of the scientific literature and the fundamentals of blockchain technology to discuss about the benefits of implementation of this tool in a reverse logistics flow to obtain greater control and security between the actors of the reverse logistics network in all material collected and directed. Five actors were listed: industry, transport, traders, waste picker cooperative, and recycler. Develop and structure a RL management model, making use of blockchain technology, has potential to enable greater transparency of the tailing's life cycle, increasing the traceability and reliability of the data obtained, and providing lower costs related to the monitoring of disposal.

Keywords: blockchain, reverse logistics, solid waste management.

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DIAGNÓSTICO DO SISTEMA DE ABASTECIMENTO DE ÁGUA DE COMUNIDADES RURAIS NA REGIÃO DO CARIRI CEARENSE

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DIAGNOSIS OF THE WATER SUPPLY SYSTEM OF RURAL COMMUNITIES IN CARIRI REGION OF CEARÁ STATE

Recibido el 2 de abril de 2023. Aceptado el 27 de junio de 2023

Abstract

Water management in rural communities is a challenge for the universalization of sanitation in Brazil. This study evaluated the conditions of water supply in communities in the municipalities of Barbalha, Crato, Farias Brito and Juazeiro do Norte, in the interior of Ceará, through sustainability indicators. The social actors and public policies present in these municipalities were identified. Then, eight locations were visited to apply the indicators and classify them into a sustainability level. Two communities were considered unsustainable for not having a solution guaranteeing sufficient water for families. The best rates were in the solutions managed in partnership with the Rural Sanitation System (SISAR). This work is important for portraying the supply in the communities and for presenting the use of indices as a management tool. The information obtained can be useful for policy planning and can be replicated in other locations.

Keywords: access to water, rural sanitation, universalization, alternative supply solution.

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MODELS FOR ESTIMATING SOLID WASTE PRODUCTION IN HOSPITALITY ESTABLISHMENTS IN JOÃO PESSOA, BRAZIL

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Abstract

Municipalities are responsible for solid waste management in urban areas, from collection to final treatment, in case the waste produced by economic agents is not dangerous. In the scope of economic activities, tourism has been growing strongly, especially in Brazilian coastal urban areas. In this sense, a larger production of urban solid waste is one of the main effects of the development of the hospitality sector. This study aims to design models to estimate the production of solid waste in hospitality establishments. This research object refers to a sample of 7 hotels in the city of João Pessoa, Brazil. Solid waste generated by the hotel sector in the city of João Pessoa was estimated by developing linear regression models. The models showed that 71% of the waste refers to the number of guests, number of employees, and services offered in the hotel. Results indicate an estimated solid waste generated by hotel establishments in the city of João Pessoa of 4,148 kg.day-[1], out of which 59.2% are organic waste, 21.8% are recyclable, and 18.9% are non-recyclable.

Keywords: solid waste, hospitality sector, environmental management.

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ECONOMIC ASSESSMENT OF MUNICIPAL SOLID WASTE MANAGEMENT IN MIDSIZED METROPOLITAN AREAS OF BRAZIL

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Recibido el 14 de mayo de 2023. Aceptado el 15 de agosto de 2023

Abstract

This paper addresses the incipient number of studies regarding municipal solid waste management in Brazil, where the federal law requires the inclusion of waste pickers in waste management and proposes waste diversion targets far from being attained. Therefore, decision-makers can make the best choice economically among alternative technological roadmaps that meet the legal requirements. The proposed alternatives combine biowaste treatments (open composting, closed composting, anaerobic digestion), recycling and final disposal methods (landfill and incineration) for a metropolitan region with two million inhabitants. The results show that incineration can lower the costs for the citizens, and the cost increase is modest if anaerobic digestion is chosen if no profit is intended after 20 years (IRR=0%). However, higher profit (8% and 16% IRR) causes a significant increase in the service fees, which could encourage the use of composting facilities with lower environmental performance. Furthermore, the high waste diversions scenarios have lower service fees than the low diversions counterparts because of the increase in revenue from sales of recyclable materials and employing 5,697 instead of 2,138 pickers to work at sorting facilities, therefore highly recommended.

Keywords: economic assessment, biodegradable waste, recyclable waste, commingled waste, developing countries.

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FITORREMEDIACIÓN Y MICRORREMEDIACIÓN DE SUELOS CONTAMINADOS POR PLOMO (Pb) Y CADMIO (Cd)

* Antônio Rony da Silva Pereira Rodrigues [1]

PHYTOREMEDIATION AND MICROREMEDIATION OF SOILS CONTAMINATED BY LEAD (Pb) AND CADMIUM (Cd)

Recibido el 21 de mayo de 2023. Aceptado el 22 de agosto de 2023

Abstract

Heavy metals such as lead and cadmium can cause serious damage to human health, since, not being dissolved by the human body, sustainable ways to remove heavy metals from the soil are phytoremediation and microremediation. The present study aimed to evaluate in the literature the species involved in the sustainable removal of lead and cadmium from contaminated soils. We chose to carry out an integrative review of the literature, through an extensive search of studies in the Scopus and Web of Science databases. The results show that species such as *Chrysopogon zizaniodes and* Paspalum fasciculatum can be an alternative for the elimination of Cd and Pb, because they have resistance and act as bioaccumulators of these compounds, in addition to having a rapid growth. The *Trichoderma asperellum* fungus was also viable, as it has a maximum removal efficiency rate of 76.17% and 68.4% for cadmium and lead, respectively. The use of phytoremediation and microremediation are essential to ensure the health of soils and the quality of cultivated food, as it is a low-cost and sustainable technology, it can be easily inserted by rural producers and researchers.

Keywords: bioremediation, environmental contamination, heavy metals.

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COMPARATIVE ECOTOXICOLOGICAL EVALUATION OF TANNIN COAGULANTS FROM BLACK WATTLE AND FERROUS ALUMINUM SULFATE IN THE TREATMENT OF SLAUGHTERHOUSE EFFLUENT

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Abstract

Ecotoxicological assessments are crucial for environmental monitoring as they can pre-dict the adverse effects of ecotoxins, such as coagulants, on the ecosystems using contamination bioindicators. This study evaluated the ecotoxicity of two types of coagulants, an inorganic coagulant, ferrous aluminum sulfate (SF), and a biocoagulant based on tannins extracted from black wattle, used in the treatment of cattle slaughterhouse effluents. The planaria *Girardia tigrina*, which is used as a bioindicator of toxicity in freshwater ecosystems, was used as the test organism for this study. To select the appropriate tannin coagulant for the effluent under study, two types of biocoagulants were investigated: Tanfloc SG (SG) and Tanfloc MTH (MTH), with SG coagulant showing better performance (98.5 % turbidity removal). In the ecotoxicological test, SG and SF coagulants were compared. Both the tannin-based coagulant SG and the inorganic SF were effi-cient for the treatment of the evaluated effluent, yet their lethal concentrations (LC50 - 96h) with regard to *G. tigrina* was 32.24 % and 42.24 %, respectively. Thus, our results suggest that the effluent treated with the tannin-based coagulant SG showed greater toxicity to *G. tigrina* than the inorganic coagulant ferrous aluminum sulfate.

Keywords: ecotoxicology, black wattle tannin, ferrous aluminum sulfate, slaughterhouse effluents, bioindicators, biocoagulants.

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PRODUÇÃO DE CARVÃO ATIVADO A PARTIR DA PIRÓLISE DA CASCA DE LARANJA

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PRODUCTION OF ACTIVATED CHARCOAL FROM PYROLYSIS OF ORANGE PEEL

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Abstract

The search for sustainable and economically viable alternatives for the use of biomass has been motivated by the environmental impacts caused by the use of fossil fuels in energy generation, by the increase in the price of oil — a non-renewable source — and by the abundance of agro-industrial residues. Furthermore, biomass represents a source of renewable energy. As Brazil is the largest producer of oranges in the world, a large amount of residual biomass is generated, not always receiving an adequate final destination, which can cause environmental damage. Therefore, the objective of this study is to convert orange peel into activated carbon through the pyrolysis process and to characterize the resulting product. Dry biomass was characterized through immediate analysis: moisture content (0.88%), ash content (1.36%), volatile material (85.37%), fixed carbon content (12.39%) and density (0.44%). The thermal degradation of the residue was carried out in a fixed bed reactor, at two different temperatures (500 °C and 600 °C) for 30 minutes of degradation, at a rate of 30 °C/min. The activated carbon yield was 27.092% during the pyrolysis performed at 500°C, while it reached 18.094% in the pyrolysis at 600°C. After the conclusion of the pyrolysis experiments, the collection, storage and characterization of samples of adsorbent material produced during this process were carried out. The characterization was carried out using the same parameters that were applied in the analysis of dried orange peel. In addition, a methylene blue adsorption test was conducted on an orbital shaker table, following a face-centered design plan with 11 different combinations of mass and dye concentration. The adsorption time was kept constant at 30 minutes, and the volume of the solution used in all tests was set at 30 mL. The experiment revealed that the adsorption capacity of this carbon becomes more efficient with a low amount of mass and a high concentration of methylene blue dye. After analyzing the results, the efficiency of using orange peel biomass in the production of activated carbon, with adsorbent capacity, through pyrolysis, can be seen.

Keywords: biomass, orange peel, activated carbon, residue, reuse.

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GERAÇÃO DE BIOGÁS A PARTIR DA DIGESTÃO ANAERÓBIA DE RESÍDUOS DA DIETA DE CULTIVO DE INSETOS

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BIOGAS GENERATION FROM ANAEROBIC DIGESTION OF RESIDUES FROM THE INSECT CULTIVATION DIET

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Abstract

The exponential growth of solid waste generation has become a worrying factor around the world, due to the negative impacts caused to fauna, flora and public health when inappropriately disposed. An alternative for treating organic waste is anaerobic digestion, which generates biogas that can be reused for electricity and fuel, also reducing the mass of waste to be disposed of. This study aimed to evaluate the potential for biogas generation of an organic waste, generated from diets from the cultivation of organisms for integrated pest management, composed of whole wheat flour and brewer's yeast, in addition to quantifying the generation of biogas. The potential for methane generation, using AME – Specific Methanogenic Activity. The tests were conducted in two stages and the AME test values found in the first stage ranged between 0.025 and 0.180 gCOD CH_4/gSSV.d and substrate degradability was 90.64%. For the second stage the values were between 0.004 and 0.041 gCOD CH_4/gSSV.d and maximum degradability of the residue was 65.75%. The theoretical volume of methane generated in CNTP with 100% substrate degradation (L CH_4) was 0.786L in the first stage and 0.943L in the second stage. The volumes of methane generated in the tests were 0.789L and 0.804L in the first stage and 0.700L and 0.482L in the second stage. Thus, it is concluded that this residue has the potential for biogas generation and the methane production was within the expected range in the literature.

Keywords: anaerobic digestion, biogas, methane, specific methanogenic activity.

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AVALIAÇÃO DOS IMPACTOS NO SOLO DA ÁREA DE DISPOSIÇÃO FINAL DE RESÍDUOS SÓLIDOS URBANOS NO MUNICÍPIO DE TUCURUÍ-PA

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EVALUATION OF SOIL IMPACTS IN THE FINAL DISPOSAL AREA OF URBAN SOLID WASTE IN THE MUNICIPALITY OF TUCURUÍ-PA

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Abstract

The inadequate final disposal of waste causes public health problems such as the proliferation of disease vectors, generation of foul odors, and pollution of underground and surface waters. The municipality of Tucuruí-PA uses an open dump as its final disposal method, and even after the implementation of the National Waste Policy and the New Legal Framework for Sanitation, there haven't been effective actions to change this final disposal scenario. In light of this, this research consisted of an evaluation of the environmental impacts of the area, as well as an investigation of the soil quality at the site. In the field, some aspects stood out, such as open-air waste, presence of waste pickers, and hazardous waste, housing, accumulation of leachate, and waste burning were observed, which can have significant impacts on health and the environment. The granulometric analyses revealed a predominance of clayey soil, which contributes to the impermeability of the surface layer. The estimation of the average leachate flow was calculated using the water balance, combined with the swiss method, and proved to be significant when compared to a large landfill.

Keywords: contamination, soil, dumping ground, leached.

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DIAGNÓSTICO AMBIENTAL DO DESCARTE IRREGULAR DE RESÍDUOS DA CONSTRUÇÃO CIVIL EM QUATRO BAIRROS DA ÁREA URBANA DE CAMPINA GRANDE - PB

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ENVIRONMENTAL DIAGNOSIS OF IRREGULAR DISPOSAL OF CIVIL CONSTRUCTION WASTE IN FOUR NEIGHBORHOODS IN THE URBAN AREA OF CAMPINA GRANDE - PB

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Abstract

The construction industry is one of the human activities that generates the most waste worldwide. Construction waste includes remnants of materials such as concrete, bricks, wood, and metals, among others. Although many of these materials can be recycled or reused, improper disposal of construction waste is a growing concern worldwide, especially in rapidly growing and developing cities. Improper disposal of construction waste can cause severe environmental impacts, such as soil and water pollution, degradation of air quality, and an increased risk of floods and landslides. In this context, the study assesses the improper disposal of construction waste in some neighborhoods of the municipality of Campina Grande, located in the state of Paraíba in the Brazilian Northeast. This study investigated the environmental and public health impacts caused by the inadequate management of construction waste. Problems such as the proliferation of disease-transmitting mosquitoes, respiratory issues, and soil and water contamination were identified. Given these results, the adoption of waste management measures and public awareness for proper disposal of materials is urgently needed.

Keywords: construction waste, environmental impacts, environmental management, inadequate management, public health.

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Resumo

O uso crescente de agrotóxicos em atividades agrícolas causa preocupação quanto à presença desses compostos nos mananciais. Os processos de tratamento de água usados na maioria das cidades têm limitada capacidade de remover agrotóxicos. Isto significa que, ao serem detectados nas captações, possivelmente estarão presentes nos sistemas de distribuição de água tratada. Um dos instrumentos usados para avaliar a contaminação e promover políticas públicas voltadas à preservação da saúde pública é o monitoramento da qualidade das águas. Contudo, o monitoramento representativo dos agrotóxicos constitui um desafio. Diversas incertezas estão associadas a esse problema. A presença de agrotóxicos nos mananciais é influenciada por vários fatores, tais como, a dependência das precipitações, as condições de umidade do solo, as características químicas dos compostos e o grau de antropização da bacia hidrográfica. Face às questões abordadas, este artigo propõe uma metodologia para aumentar a representatividade do monitoramento de agrotóxicos em amostras de água para consumo humano. A metodologia emprega a análise multicritério para selecionar um conjunto de municípios cujas captações serão monitoradas conforme uma distribuição mensal escalonada, ao longo dos dois semestres do ano. Dessa forma, é possível obter 12 amostras por parâmetro neste período. Baseadas nas avaliações iniciais são elaboradas recomendações para priorizar os agrotóxicos que devem permanecer no programa de monitoramento do ano seguinte, bem como às frequências de coletas. Além de otimizar custos, essas avaliações anuais permitem aos formuladores de políticas estabelecerem as melhores ações para minimizar a presença de agrotóxicos em águas destinadas ao consumo humano.

Palavras-chave: plano de monitoramento da qualidade da água, monitoramento de agrotóxicos na água, agrotóxicos em águas, análise multicritério, qualidade da água para consumo humano.

Introdução

Os agrotóxicos são substâncias químicas empregadas para eliminar espécies nocivas, incluindo insetos, fungos e ervas daninhas. Atualmente, existem mais de 1000 diferentes tipos de agrotóxicos usados no mundo (WHO, 2020). Apesar do seu uso crescente, a detecção de agrotóxicos nas captações dos sistemas de abastecimento de água é complexa devido aos fatores climáticos, às características da bacia hidrográfica, aos tipos de culturas, à época de aplicação e às propriedades químicas dos compostos. Estudos indicam que, quando aplicados, apenas uma pequena quantidade dos agrotóxicos tem um papel protetor no combate às doenças das plantas. Em contraste, uma grande parcela atinge alvos não visados, como o solo, e, através dele seguem diferentes rotas, podendo ser volatilizados, lixiviados para águas superficiais e subterrâneas, adsorvidos ou degradados (Tudi *et al.*, 2021). Também é comum casos de deriva pelo ar durante a aplicação, mesmo a partir de equipamentos terrestres (Araújo, 2019).

As análises químicas de agrotóxicos na água podem ser demoradas e dispendiosas dependendo da infraestrutura existente no local a monitorar. A diversidade de compostos que podem estar envolvidos em processos de contaminação constitui um desafio para o desenvolvimento e manutenção de um programa contínuo de monitoramento ao longo do tempo (Spycher *et al.*, 2018). Os períodos de aplicação de cada ingrediente ativo estão relacionados à sazonalidade pronunciada de sua presença nos mananciais (Chow *et al.*, 2020). Além disso, o seu transporte