Wastewater

1-Recent Advances in the Remediation of Textile-Dye-Containing Wastewater: Prioritizing Human Health and Sustainable Wastewater Treatment

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By Periyasamy, AP (Periyasamy, Aravin Prince) [1] (provided by Clarivate) **Source SUSTAINABILITY Volume 16 Issue 2 DOI 10.3390/su16020495 Article Number 495 Published JAN 2024 Indexed 2024-02-05 Document Type Review**

Abstract

Water makes up most of the Earth, although just 0.3% is usable for people and animals. The huge oceans, icecaps, and other non-potable water resources make up the remaining 99.7%. Water quality has declined in recent decades due to pollution from population growth, industry, unplanned urbanization, and poor water management. The textile industry has significant global importance, although it also stands as a major contributor to wastewater generation, leading to water depletion and ecotoxicity. This issue arises from the extensive utilization of harmful chemicals, notably dyes. The main aim of this review article is to combine and assess the impacts of textile wastewater that contains dyes and chemicals, and to examine their potential consequences on human health, aquatic health, and the environment. Moreover, the dedicated section presents an in-depth review of various environmentally sustainable approaches for the management and treatment of wastewater in the textile industry. These approaches encompass bio adsorbents, biological methods, membrane technology, ion exchange, advanced oxidation processes, as well as physicochemical and biochemical processes. Furthermore, this study also evaluates the contemporary progressions in this particular domain, taking into account the corresponding advantages and disadvantages. Finally, this article highlights the significance of recovering and reusing dyes, alkalis, and electrolytes in wastewater treatment. Additionally, it emphasizes the necessity of performing technoeconomic analyses and life cycle assessments (LCA) on wastewater treatment plants.

Keywords
Author Keywords
effluentsecotoxicitydyescarcinogenicitytextile wastewatersustainability

Keywords Plus
REACTIVE BLUE 19ADVANCED OXIDATION PROCESSESAQUEOUS-SOLUTIONAZO-DYESCONGO REDBIOLOGICAL TREATMENTFENTON PROCESSMETHYL-ORANGEBLACK 5CORYNEBACTERIUM-GLUTAMICUM

Wastewater

2-Environmental impacts and remediation of dye-containing wastewater

By Lin, JY (Lin, Jiuyang) [1] , [2] , [3] ; Ye, WY (Ye, Wenyuan) [4] ; Xie, M (Xie, Ming) [5] ; Seo, DH (Seo, Dong Han) [6] ; Luo, JQ (Luo, Jianquan) [7] ; Wan, YH (Wan, Yinhua) [1] , [2] , [3] ; van der Bruggen, B (van der Bruggen, Bart) [8] (provided by Clarivate) **Source NATURE REVIEWS EARTH & ENVIRONMENT Volume 4 Issue 11 Page 785-803 DOI 10.1038/s43017-023-00489-8 Published NOV 2023 Early Access OCT 2023 Indexed 2023-11-08 Document Type Review**

Abstract

Synthetic dyes are used in various industries including textile processing, food production and the pharmaceutical sector. Yet, approximately 80% of the dye-containing wastewaters produced are often released untreated into waterways or used directly for irrigation, causing detrimental impacts on human health and ecosystems. In this Review, we discuss the environmental impact of dye-containing wastewater and explore the chemical, biological and physical mitigation strategies used to treat and decontaminate dye-containing wastewaters. Untreated synthetic dyes cause coloration of receiving water bodies, hindering the degree of visible light reaching the photic ozone, and have carcinogenic, mutagenic and teratogenic properties that have toxic impacts on plants, animals and humans. Chemical treatment methods such as coagulation are the most widely adopted treatment methods; however, they require careful sludge management to be effective. Biological degradation, involving the implementation of enzymes, microorganisms and plants, is an environmentally friendly and energy-efficient approach for dye degradation, but it requires lengthy reaction times and the use of selective bio-organisms for target dyes. Advanced membrane-based physical separation can achieve effective removal of dyes and inorganic salts from highly saline dye-containing wastewater, while also enabling their recovery and reuse. Strengthened regulatory requirements and development of non-toxic dyes are required in conjunction with these remediation treatments to effectively mitigate dye-related pollution.

Wastewater dyes from textile, food and pharmaceutical industries are a major environmental concern. This Review discusses the environmental impacts of dye-containing wastewater and explores both conventional and emerging remediation strategies.

Untreated synthetic dyes released into aquatic environments reduce the light available for photosynthesis by primary producers, with consequential impacts for the whole food chain. In addition, dyes are also directly harmful to plants, animals and humans, with human health implications including increasing allergy and cancer risk.Chemical coagulation and electro-coagulation are widely adopted methods of dye removal. However, coagulant efficacy and sludge management are crucial for efficient removal of dyes.Advanced oxidation processes, which encompass chemically mediated advanced oxidation processes, photocatalysis and electrocatalysis, have been proven effective at dye degradation. To ensure these methods are sustainable and safe, it is crucial to minimize chemical and energy consumption and monitor and manage the toxic by-products that can be generated during the process.Biological degradation is an eco-friendly and energy-efficient method for dye removal through the utilization of enzymes, microorganisms (bacteria, fungi, yeast and algae) and plants, but these methods require a long reaction time, owing to slow kinetics during dye degradation.Emerging membrane-based physical separation techniques, including tight ultrafiltration, loose nanofiltration and electro-driven

nanofiltration, show a great potential in fractionation of dyes and salts from highly saline dye-containing wastewater. These methods also enable efficient recovery of dyes and salts to promote a circular economy in the textile sector.To achieve sustainable and safe synthetic dye use, these advanced remediation technologies must be implemented in combination with proper regulation of dye-containing wastewater discharge in collaboration between governing bodies and industry stakeholders.

Keywords

Keywords Plus

THIN-FILM COMPOSITELOOSE NANOFILTRATION MEMBRANESUSTAINABLE RESOURCE EXTRACTIONAZO DYESTEXTILE DYESELECTRODIALYSIS PROCESSINSPIRED CODEPOSITIONADSORPTIVE MEMBRANESCONSTRUCTED WETLANDORGANIC POLLUTANTS

Wastewater

3-Photocatalytic Dye Degradation from Textile Wastewater: A Review

By Khan, S (Khan, Sadia) [1] ; Noor, T (Noor, Tayyaba) [1] ; Iqbal, N (Iqbal, Naseem) [2] ; Yaqoob, L (Yaqoob, Lubna) [3] (provided by Clarivate) **Source ACS OMEGA Volume 9 Issue 20 Page 21751-21767 DOI 10.1021/acsomega.4c00887 Published MAY 10 2024 Early Access MAY 2024 Indexed 2024-05-25 Document Type Review**

Abstract

The elimination of dyes discharged from industrial wastewater into water bodies is crucial due to its detrimental effects on aquatic organisms and potential carcinogenic impact on human health. Various methods are employed for dye removal, but they often fall short in completely degrading the dyes and generating large amounts of suspended solids. Hence, there is a critical need for an efficient process that can achieve complete dye degradation with minimal waste emission. Among traditional water treatment approaches, photocatalysis stands out as a promising method for degrading diverse toxic and organic pollutants present in wastewater. In this review, the heterogeneous photocatalysis process is well explained for dye removal. This comprehensive review not only provides insightful illumination on the classification of dyes but also thoroughly explains various dye removal methods and the underlying mechanisms of photocatalysis. Furthermore, factors which effect the activity of the photocatalysis process are also explained in detail. Likewise, we categorized the heterogeneous photocatalyst in three generations and observed their activity for dye removal. This review also addresses the challenges and effectiveness of this promising field. Its primary aim is to offer a comprehensive overview of the photocatalytic degradation of pollution and to explore its potential for further future applications.

Keywords

Keywords Plus

METAL-OXIDEENVIRONMENTAL APPLICATIONSTITANIUM-DIOXIDEACTIVATED CARBONREACTIVE DYESAZO DYESTIO2REMOVALZNONANOPARTICLES

Wastewater

4-Innovations and challenges in adsorption-based wastewater remediation: A comprehensive review

By Satyam, S (Satyam, Satyam) [1] ; Patra, S (Patra, Sanjukta) [1] (provided by Clarivate) **Source HELIYON Volume 10 Issue 9 DOI 10.1016/j.heliyon.2024.e29573 Article Number e29573 Published MAY 15 2024 Early Access APR 2024 Indexed 2024-05-16 Document Type Article**

Abstract

Water contamination is an escalating emergency confronting communities worldwide. While traditional adsorbents have laid the groundwork for effective water purification, their selectivity, capacity, and sustainability limitations have driven the search for more advanced solutions. Despite many technological advancements, economic, environmental, and regulatory hurdles challenge the practical application of advanced adsorption techniques in large-scale water treatment. Integrating nanotechnology, advanced material fabrication techniques, and datadriven design enabled by artificial intelligence (AI) and machine learning (ML) have led to a new generation of optimized, high-performance adsorbents. These advanced materials leverage properties like high surface area, tailored pore structures, and functionalized surfaces to capture diverse water contaminants efficiently. With a focus on sustainability and effectiveness, this review highlights the transformative potential of these advanced materials in setting new benchmarks for water purification technologies. This article delivers an in-depth exploration of the current landscape and future directions of adsorbent technology for water remediation, advocating for a multidisciplinary approach to overcome existing barriers in large-scale water treatment applications.

Keywords

Author Keywords

Wastewater remediationAdsorbent materialsWater purificationMaterial scienceNanotechnologyMetal organic frameworkAdvanced fabrication methodsArtificial intelligenceMachine learningSustainable solutions

Keywords Plus

COVALENT ORGANIC FRAMEWORKSENHANCED ADSORPTIONMETHYL-ORANGEFORCE-FIELDREMOVALADSORBENTSBIOCHARDEGRADATIONSULFAMETHOXAZOLENANOMATERIALS

Wastewater

5-A systematic review of industrial wastewater management: Evaluating challenges and enablers

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By Singh, BJ (Singh, Bikram Jit) [1] ; Chakraborty, A (Chakraborty, Ayon) [2] ; Sehgal, R (Sehgal, Rippin) [3] (provided by Clarivate) **Source JOURNAL OF ENVIRONMENTAL MANAGEMENT Volume 348 DOI 10.1016/j.jenvman.2023.119230 Article Number 119230 Published DEC 15 2023 Early Access OCT 2023 Indexed 2023-11-28 Document Type Review**

Abstract

The study provides a systematic literature review (SLR) encompassing industrial wastewater management research from the past decade, examining enablers, challenges, and prevailing practices. Originating from manufacturing, energy production, and diverse industrial processes, industrial wastewater's handling is critical due to its potential to impact the environment and public health. The research aims to comprehend the current state of industrial wastewater management, pinpoint gaps, and outline future research prospects. The SLR methodology involves scouring the Scopus database, yielding an initial pool of 253 articles. Refinement via search code leaves 101 articles, followed by abstract screening that reduces articles to 79, and finally 66 wellfocused articles left for thorough full-text examination. Results underscore the significance of regulatory frameworks, technological innovation, and sustainability considerations as cornerstones for effective wastewater management. However, substantial impediments like; inadequate infrastructure, resource constraints and the necessity for stakeholder collaboration still exist. The study highlights emerging research domains, exemplified by advanced technologies like nanotechnology and bioremediation, alongside the pivotal role of circular economy principles in wastewater management. The SLR offers an exhaustive view of contemporary industrial wastewater management, accentuating the imperative of an all-encompassing approach that integrates regulatory, technological, and sustainability facets. Notably, the research identifies gaps and opportunities for forthcoming exploration, advocating for interdisciplinary research and intensified stakeholder collaboration. The study's insights cater to policymakers, practitioners, and researchers, equipping them to address the challenges and capitalize on prospects in industrial wastewater management effectively.

Keywords
Author Keywords
Waste water treatment plantBioremediationHydroponicsHybrid AI methodsActivated sludgeWater footprint

Keywords Plus
TREATMENT PLANTSURBANTECHNOLOGIESPROGRESSQUALITYIMPACTFATECONTAMINANTSCONSUMPTIONSUBSTANCES

Wastewater

6-Ammonia recovery from nitrate-rich wastewater using a membrane-free electrochemical system

By Zhang, G (Zhang, Gong) [1] ; Li, BG (Li, Binggong) [1] ; Shi, YF (Shi, Yanfeng) [1] ; Zhou, Q (Zhou, Qi) [2] , [3] ; Fu, WJ (Fu, Wen-Jie) [4] ; Zhou, G (Zhou, Gang) [5] ; Ma, J (Ma, Jun) [1] ; Yin, S (Yin, Shuo) [6] ; Yuan, WH (Yuan, Weihao) [6] ; Miao, SY (Miao, Shiyu) [1] ; (provided by Clarivate)
Source NATURE SUSTAINABILITY Volume 7 Issue 10 DOI 10.1038/s41893-024-01406-7 Published OCT 2024 Early Access AUG 2024 Indexed 2024-09-10 Document Type Article

Abstract

Electrocatalytic nitrate reduction has great potential for simultaneously achieving ammonia recovery and nitrate-rich wastewater treatment. However, the complexity of wastewater matrices has long hampered its implementation and commercialization in the wastewater treatment industry. Here we develop a membrane-free electrochemical system, called electrochemical NO3- conversion synchronized with NH3 recovery (ECSN), which synchronizes nitrate reduction with ammonia recovery for treating real nitrate-rich wastewater. Key components of this system include a 3D-printed metallic glass decorated Cu-Ni (MPCN) working electrode bearing good corrosion resistance and a UV-assisted stripping unit. When treating real electroplating wastewater, the ECSN system converts over 70% of nitrate into high-purity ammonia chloride. Long-term stability test demonstrates the robustness of the ECSN system in treating real wastewater. Further, the economic feasibility and environmental benefits of this system are evidenced by technoeconomic analysis and life-cycle analysis. Overall, this work brings the electrocatalytic nitrate reduction process one step closer to practical application, contributing to both environmental protection and the circularity of anthropogenic nitrogen flow.

Recovering ammonia from wastewater via electrochemical nitrate reduction would support a circular economy. Here the authors develop a membrane-free electrochemical system that allows efficient and robust ammonia recovery from real nitrate-rich wastewater.

Keywords

Keywords Plus

OXIDATIONELECTROSYNTHESISREDUCTION

Wastewater

7-Advanced photocatalysis as a viable and sustainable wastewater treatment process: A comprehensive review

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By Iqbal, MA (Iqbal, Muhammad Ahtasham) [1] ; Akram, S (Akram, Sumia) [2] ; Khalid, S (Khalid, Shahreen) [1] ; Lal, B (Lal, Basant) [3] ; Ul Hassan, S (Ul Hassan, Sohaib) [4] ; Ashraf, R (Ashraf, Rizwan) [5] ; Kezembayeva, G (Kezembayeva, Gulmira) [6] ; Mushtaq, M (Mushtaq, Muhammad) [1] ; Chinibayeva, N (Chinibayeva, Nurzhan) [7] ; Hosseini-Bandegharaei, A (Hosseini-Bandegharaei, Ahmad) [8] , [9] , [10] (provided by Clarivate) **Source ENVIRONMENTAL RESEARCH Volume 253 DOI 10.1016/j.envres.2024.118947 Article Number 118947 Published JUL 15 2024 Early Access MAY 2024 Indexed 2024-06-17 Document Type Review**

Abstract

In our era, water pollution not only poses a serious threat to human, animal, and biotic life but also causes serious damage to infrastructure and the ecosystem. A set of physical, chemical, and biological technologies have been exploited to decontaminate and/or disinfect water pollutants, toxins, microbes, and contaminants, but none of these could be ranked as sustainable and scalable wastewater technology. The photocatalytic process can harmonize the sunlight to degrade certain toxins, chemicals, microbes, and antibiotics, present in water. For example, transition metal oxides (ZnO, SnO2, TiO2, etc.), when integrated into an organic framework of graphene or nitrides, can bring about more than 90% removal of dyes, microbial load, pesticides, and antibiotics. Similarly, a modified network of graphitic carbon nitride can completely decontaminate petrochemicals. The present review will primarily highlight the mechanistic aspects for the removal and/or degradation of highly concerned contaminants, factors affecting photocatalysis, engineering designs of photoreactors, and pros and cons of various wastewater treatment technologies already in practice. The photocatalytic reactor can be a more viable and sustainable wastewater treatment opportunity. We hope the researcher will find a handful of information regarding the advanced oxidation process accomplished via photocatalysis and the benefits associated with the photocatalytic-type degradation of water pollutants and contaminants.

Keywords

Author Keywords

Advanced oxidation processPhotocatalysisWastewater treatmentPhotoreactorsPros and cons

Keywords Plus

AQUEOUS-SOLUTIONHETEROGENEOUS PHOTOCATALYSISORGANIC POLLUTANTSTITANIUM-DIOXIDEMALACHITE GREENLIGHT-INTENSITYAZO-DYEPHOTODEGRADATION KINETICSOPERATIONAL PARAMETERSDEGRADATION CONDITIONS

Wastewater

8-Harnessing corn straw biochar: A breakthrough in eco-friendly Cu(II) wastewater treatment

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By Li, N (Li, Na) [1] ; Zhu, FC (Zhu, Fuchen) [1] ; Wang, ZW (Wang, Zhaowei) [1] ; Wu, JH (Wu, Jinghui) [1] , [2] ; Gao, YD (Gao, Yidi) [2] ; Li, KQ (Li, Keqing) [2] ; Zhao, CL (Zhao, Chunliang) [2] ; Wang, XZ (Wang, Xianze) [1] , [2] (provided by Clarivate) **Source WASTE MANAGEMENT Volume 197 Page 25-34 DOI 10.1016/j.wasman.2025.02.027 Published APR 15 2025 Early Access FEB 2025 Indexed 2025-03-05 Document Type Article**

Abstract

To investigate an energy-efficient, environmentally friendly, and highly efficient biochar for adsorbing Cu(II)containing wastewater, corn straw hydrothermal char prepared at 240 degrees C for 2 h was used as a precursor. Silicon (Si)-Manganese (Mn) impregnation modification was then performed to produce the modified biochar (bBC). The study found that Si and Mn were loaded onto the b-BC surface in the form of oxides. The distinct hierarchical Si membrane effectively stabilized Mn oxides and increased the specific surface area. Under different pH conditions, the effect of Mn rendered b-BC consistently negatively charged in the solution, facilitating electrostatic attraction with Cu(II). Fourier-transform infrared and X-ray photoelectron spectroscopy results revealed that b-BC's surface had numerous oxygen-containing functional groups, effectively binding with Cu(II). Adsorption experiments showed that, at an addition amount of 1.47 g/L and pH of 7, b-BC displayed a significant adsorption capacity for Cu(II) at 167.884 mg/g. Pseudo-second-order adsorption kinetics and Freundlich isotherm models better described the adsorption behavior of b-BC for Cu(II). The adsorption process was primarily dominated by multilayer chemical adsorption. Webber-Morris analysis indicated that the key adsorption process occurred during the membrane diffusion stage. At this stage, Cu(II) formed bonds with the b-BC surface in the forms of Cu-O, - COOCu, Cu(OH)2, and Si/Mn-O-Cu. Chelation emerged as the most significant mechanism for b-BC adsorbing Cu(II). Due to its environmentally friendly preparation method and high efficiency in adsorbing Cu(II) from water, b-BC can be considered as a feasible rich-carbon adsorbent in the field of waste treatment.

Keywords

Author Keywords

BiocharSilicon-manganese modificationCu(II) removalWater treatment

Keywords Plus

HYDROTHERMAL CARBONIZATIONADSORPTIVE REMOVALSORPTIONCOPPERADSORBENTCADMIUMIONSLEAD

Wastewater

9-Highly efficient MoS2/MXene aerogel for interfacial solar steam generation and wastewater treatment

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By Yang, ZY (Yang, Zeyu) [1] ; Wei, N (Wei, Na) [1] , [2] , [3] ; Xue, N (Xue, Na) [1] ; Xu, RQ (Xu, Ruiqi) [2] ; Yang, EQ (Yang, Enquan) [1] ; Wang, FS (Wang, Fengshuang) [3] ; Zhu, HL (Zhu, Huiling) [1] ; Cui, HZ (Cui, Hongzhi) [1] , [2] (provided by Clarivate) **Source JOURNAL OF COLLOID AND INTERFACE SCIENCE Volume 656 Page 189-199 DOI 10.1016/j.jcis.2023.11.110 Published FEB 15 2024 Early Access NOV 2023 Indexed 2024-02-03 Document Type Article**

Abstract

Interfacial solar steam generation using aerogels holds great promise for seawater desalination and wastewater treatment. However, to achieve aerogels with both durable, high-efficiency evaporation performance and excellent salt resistance remains challenging. Here, a molybdenum disulphide (MoS2) and MXene composite aerogel with vertical pore channels is reported, which has outstanding advantages in mechanical properties, water transportation, photothermal conversion, and recycling stability. Benefiting from the plasmon resonance effect of MXene and the excellent photothermal conversion performance of MoS2, the aerogel exhibits excellent light absorption (96.58 %). The aerogel is resistant to deformation and able to rebound after water absorption, because of the support of an ordered vertical structure. Moreover, combined with the low water evaporation enthalpy, low thermal conductivity, and super hydrophilicity, the aerogel achieves an efficient and stable evaporation rate of about 2.75 kg m ⍰ 2h-1 under one sun and exhibits excellent self-cleaning ability. Notably, the evaporator achieves removal rates of 99.9 % for heavy metal ions and 100 % for organic dyes, which has great potential in applications including seawater desalination and wastewater purification.

Keywords
Author Keywords
MXeneMoS2AerogelVertical pore channelSolar steam generation

Keywords Plus
DESALINATION

Wastewater

10-pH-directed polyoxometalate-based supramolecular framework for effectively electrochemical sensing IO3-from glycerol oxidation wastewater

By Zhong, BQ (Zhong, Baoqi) [1] ; Liu, JL (Liu, Jinlong) [1] ; Liu, GC (Liu, Guocheng) [1] ; Zhang, Z (Zhang, Zhong) [1] ; Chen, YQ (Chen, Yongqiang) [2] ; Wang, XL (Wang, Xiuli) [1] (provided by Clarivate)
Source JOURNAL OF MOLECULAR STRUCTURE Volume 1332 DOI 10.1016/j.molstruc.2025.141679
Article Number 141679 Published JUN 15 2025 Early Access FEB 2025 Indexed 2025-02-26
Document Type Article

Abstract

Oxidizing pollutants within the atmosphere or aquatic environments can affect the stability and balance of the entire ecosystem. Therefore, the exploration of rational method for the detection of iodate (IO3-), a notable oxidizing pollutant, is meaningful and obligatory. In this study, a new polyoxometalate-based supramolecular framework [(H2L)3PMo12O40]& sdot;H2O (1) [[HL = 4-(benzimidazole-1-ylmethyl)benzoic acid]] was synthesized from [PMo12O40]3- and the protonated benzimidazole carboxylic acid by environmentally friendly one-pot method, which facilitated by pH adjustment. The detailed characterization of compound 1 was finished by single crystal X-ray diffraction, elemental analysis (EA), infrared (IR) spectroscopy, and X-ray powder diffraction (PXRD). Compound 1 body modified carbon paste electrode (1-CPE) exhibited significant electrocatalytic activity during the electrocatalytic reduction of IO3-, which allowed it to be used for the electrochemical detection of IO3- with robust anti-interference capabilities, stability, and low detection limit (0.427 mu M). 1-CPE also exhibited good detecting effect for the detection of iodate ions within sea water and the waste water from the oxidation reaction of glycerol. This research holds immense significance for the detection of oxidative pollutants and contributes to environmental protection efforts.

Keywords
Author Keywords
PolyoxometalateSupramolecular aggregateIodateElectrochemical detectionChemical wastewater

Keywords Plus
IODATECOORDINATIONREDUCTIONCOMPLEXESCHLORATEBROMATE

Wastewater

11-Occurrence, fate, and ecological risk of antibiotics in wastewater treatment plants in China: A review

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By Wang, BQ (Wang, Bingqing) [1] ; Xu, ZX (Xu, Zuxin) [1] ; Dong, B (Dong, Bin) [1] (pr ovided by Clarivate) **Source JOURNAL OF HAZARDOUS MATERIALS Volume 469 DOI 10.1016/j.jhazmat.2024.133925 Article Number 133925 Published MAY 5 2024 Early Access MAR 2024 Indexed 2024-04-28 Document Type Review**

Abstract

This review offers a comprehensive overview of the occurrence, fate, and ecological risk associated with six major categories of antibiotics found in influent, effluent, and sludge from urban wastewater treatment plants (WWTPs) in China. Further exploration includes examining the correlation between antibiotic residual rates in the effluents and process parameters of urban WWTPs across the country. Lastly, a nationwide and urban clusterspecific evaluation of the ecological risk posed by antibiotics in WWTPs is conducted. The findings reveal that the average concentrations of antibiotics in influent, effluent, and sludge from urban WWTPs in China are 786.2 ng/ L, 311.2 ng/L, and 186.8 mu g/kg, respectively. Among the detected antibiotics, 42% exhibit moderate to high ecological risk in the effluent, with ciprofloxacin, sulfamethoxazole, erythromycin, azithromycin, and tetracycline posing moderate to high ecological risks in sludge. The current biological treatment processes in WWTPs demonstrate inefficacy in removing antibiotics. Hence, there is a pressing need to develop and integrate innovative technologies, such as advanced oxidation processes. This review aims to offer a more comprehensive understanding and identify priority antibiotics for control to effectively manage antibiotic pollution within WWTPs at both national and regional levels.

Keywords
Author Keywords
Wastewater treatment plantsAntibioticsWater treatment processSeasonal changeEcological risk

Keywords Plus
SEWAGE-TREATMENT PLANTSPERSONAL CARE PRODUCTSPHARMACEUTICALLY ACTIVE COMPOUNDSSLUDGE EXPERIMENTAL ASSESSMENTSOLID-PHASE EXTRACTIONLIQUID-CHROMATOGRAPHYRESISTANCE GENESFLUOROQUINOLONE ANTIBIOTICSSULFONAMIDE ANTIBIOTICSSEASONAL-VARIATION

Wastewater

12-Biochar-bacteria coupling system enhanced the bioremediation of phenol wastewater-based on life cycle assessment and environmental safety analysis

By An, XJ (An, Xuejiao) [1] ; Wang, YL (Wang, Yanlin) [1] ; Yu, CL (Yu, Chenglong) [2] ; Hu, XJ (Hu, Xiaojing) [3] (provided by Clarivate) **Source JOURNAL OF HAZARDOUS MATERIALS Volume 480 DOI 10.1016/j.jhazmat.2024.136414 Article Number 136414 Published DEC 5 2024 Early Access NOV 2024 Indexed 2024-11-17 Document Type Article**

Abstract

The efficient treatment of phenol wastewater is of great necessity since it induces serious pollution of water and soil ecosystems. Using biochar-immobilized functional microorganisms can innovatively and sustainably deal with the existing problem. In this study, we utilized response surface methodology (RSM) combined with life cycle assessment (LCA) to improve phenol biodegradation rate through a novel separated alkali-resistant and thermophilic strain Bacillus halotolerans ACY. Bioinformatic analysis revealed the genetic foundation of ACY to adapt to harsh environments. The characteristics of pig manure biochar (PMB) produced at varying pyrolysis temperatures (300-700 degrees C) and adsorption experiment were investigated, immobilization of the phenoldegrading ACY on PMB600 under alkaline and high pollution load promoted phenol removal and extreme environment resistance, and the phenol removal rate reached 99.5 % in 7d in actual phenol wastewater, which increased compared with those achieved by PMB (50.6 %) and free bacteria (80.5 %) alone. Scanning Electron Microscope (SEM) and Fourier transform infrared spectrometry (FTIR) observations indicated the successful bacterial immobilization on PMB600. Reusability and economic cost study further demonstrated PMB600 as an excellent carrier for wastewater treatment. LC-MS, toxicology and carbon footprint analyses demonstrated that bacterial metabolism exerted synergy with adsorption for phenol removal, while biodegradation exerted the predominant impact on the immobilized bacterial system. This study provides an eco-friendly and effective approach to treat phenol wastewater.

Keywords
Author Keywords
ImmobilizationBioremediationPhenol wastewaterLife cycle assessmentEnvironmental safety

Keywords Plus
BIODEGRADATIONREMOVALSURFACESLUDGE

Wastewater

13-Removal and degradation of dyes from textile industry wastewater: Benchmarking recent advancements, toxicity assessment and cost analysis of treatment processes

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By Sahu, A (Sahu, Abhispa) [1] ; Poler, JC (Poler, Jordan C.) [2] **(provided by Clarivate) Source JOURNAL OF ENVIRONMENTAL CHEMICAL ENGINEERING Volume 12 Issue 5 DOI 10.1016/j.jece.2024.113754 Article Number 113754 Published OCT 2024 Early Access AUG 2024 Indexed 2024-09-10 Document Type Article**

Abstract

Clean and safe drinking water is vital. Tragically, this quality has been degraded due to the anthropomorphic and continuous discharge of toxic and non-biodegradable organic pollutants into the aquatic environment. Among the many sources of water pollution, the textile industry has become a major problem as wastewater containing dyes is often discharged into natural water bodies. Studies have shown that a major portion (similar to 20 %) of dyes is lost during synthesis and processing operations and end up in wastewater. Due to their ubiquitous industrial use, textile dyes are categorized as pollutants of major concern, posing an ongoing threat worldwide. The discharge of dyes and/or their degradation byproducts in the aquatic environment poses serious health risks to aquatic plants, organisms, and humans, making it necessary to remove them at their source. This review article aims to present and discuss the most advanced and state-of-art technical and scientific developments in the removal and degradation of dyes from textile wastewater. This review discusses the emergence of the latest nanomaterials, current focus, and superior efficiencies of the state-of-the-art materials, with emphasis on physical and chemical approaches. By comparing frequently studied treatment methods for cost and efficiency, the future outlook provides insights into selection of treatment options, knowledge gaps, and how to improve the efficiency of applicable systems. This feasibility analysis will help readers select the most efficient treatment process from both a performance and financial perspective. While multistage hybrid technologies are worth pursuing, few technologies such as ozonation and photo-Fenton have emerged as promising independent processes. Their individual combination with filtration methods has the ability to provide an economically feasible and time-efficient solution. However, there is room for further improvement in developing or tailoring models, methods and processes that target not only dyes but also secondary factors (such as chemical oxygen demand), while remaining cost-effective and affordable for all parts of the world.

Keywords

Author Keywords

Dye removal and degradationTextile dyes wastewater treatmentPhysical approachChemical degradationBiological remediation processesOperational cost analysis

Keywords Plus

Wastewater

ADVANCED OXIDATION PROCESSESSOLAR PHOTOELECTRO-FENTONWHITE-ROT FUNGIAZURE-B DYEMALACHITE GREENACTIVATED CARBONAQUEOUS-SOLUTIONMETHYLENE-BLUEELECTRO-FENTONREACTIVE DYES

Wastewater

14-Bioelectricity-driven, sulfurized Fe species anode in situ generate sulfate radicals from sulfates in antibiotic wastewater for enhanced ciprofloxacin hydrochloride removal: Performance and mechanism

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By Jiang, ST (Jiang, Shengtao) [1] ; Fang, J (Fang, Jie) [1] ; Liu, HY (Liu, Haoyang) [1] ; Tang, XY (Tang, Xiyang) [1] ; Zhu, HY (Zhu, Huayue) [1] ; Zong, EM (Zong, Enming) [1] ; Cai, YT (Cai, Yutong) [1] ; Zhao, ZT (Zhao, Zhiting) [1] ; Guo, JB (Guo, Jianbo) [1] ; Liu, YB (Liu, Yanbiao) [2] (provided by Clarivate)
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Abstract

Electro-based advanced oxidation processes are promising for treating ciprofloxacin hydrochloride (CIP center dot HCl center dot H2O) wastewater. However, high energy consumption, strict reaction conditions, and secondary pollution limit the promotion and application of these processes. To address these issues, a sulfurized Fe species-foam nickel (S-ZVI@Ni) anode is designed herein for CIP center dot HCl center dot H2O removal. Noodle-processing wastewater is selected as sole substrate in microbial fuel cells; consequently, a peak voltage of 0.5 V can be output for over 33 h. Within a wide range of influencing factors (pH 3-8 and Fe content 7.5-20.3 mg cm- 2), the removal efficiency (RE) for CIP center dot HCl center dot H2O can reach over 80 %, even up to a maximum of 93 %. After eight cycles, CIP center dot HCl center dot H2O RE of S-ZVI@Ni anode can still reach 81 %, while RE of ZVI@Ni anode is only 35 %. Sulfate originally present in antibiotic wastewater is converted into persulfate, which then generates multiple free radicals, with SO.- 4 being the key active species in CIP center dot HCl center dot H2O degradation process. Carbon stoichiometry results indicate that the conversion of CIP center dot HCl center dot H2O into organic acids by ZVI@Ni anode tends to lag that of SZVI@Ni anode. Furthermore, the density functional theory results reveal that among Fe species used here, FeS can catalytically decompose persulfate, and its catalytic ability is second only to that of Fe0 (i.e., ZVI); however, the poor actual performance of Fe0 may be attributed to its surface oxidation and passivation. This work provides important insights into low energy, secondary pollutionless, and sustainable operation for the advanced oxidation treatment of antibiotic wastewater.

Keywords
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