Wastewater Treatment

1- Membrane Technologies in Wastewater Treatment: A Review

By:
Ezugbe, EO (Obotey Ezugbe, Elorm) [1] ; Rathilal, S (Rathilal, Sudesh) [1]
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Abstract

In the face of water shortages, the world seeks to explore all available options in reducing the over exploitation of limited freshwater resources. One of the surest available water resources is wastewater. As the population grows, industrial, agricultural, and domestic activities increase accordingly in order to cater for the voluminous needs of man. These activities produce large volumes of wastewater from which water can be reclaimed to serve many purposes. Over the years, conventional wastewater treatment processes have succeeded to some extent in treating effluents for discharge purposes. However, improvements in wastewater treatment processes are necessary in order to make treated wastewater re-usable for industrial, agricultural, and domestic purposes. Membrane technology has emerged as a favorite choice for reclaiming water from different wastewater streams for re-use. This review looks at the trending membrane technologies in wastewater treatment, their advantages and disadvantages. It also discusses membrane fouling, membrane cleaning, and membrane modules. Finally, recommendations for future research pertaining to the application of membrane technology in wastewater treatment are made.

Keywords
Author Keywords
membrane technologywastewaterpotable waterfouling
Keywords Plus

Wastewater Treatment

VOLATILE ORGANIC-COMPOUNDSCONCENTRATION POLARIZATIONDRAW SOLUTESPERVAPORATION SEPARATIONOSMOSIS MEMBRANESAQUEOUS-SOLUTIONSHYBRID SYSTEMAIR-GAPDISTILLATIONDESALINATION

Wastewater Treatment

2- Integrating micro-algae into wastewater treatment: A review

By:
Mohsenpour, SF (Mohsenpour, Seyedeh Fatemeh) [1] ; Hennige, S (Hennige, Sebastian) [2] ; Willoughby, N (Willoughby, Nicholas) [1] ; Adeloye, A (Adeloye, Adebayo) [3] ; Gutierrez, T (Gutierrez, Tony) [4]
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Abstract

Improving the ecological status of water sources is a growing focus for many developed and developing nations, in particular with reducing nitrogen and phosphorus in wastewater effluent. In recent years, mixotrophic microalgae have received increased interest in implementing them as part of wastewater treatment. This is based on their ability to utilise organic and inorganic carbon, as well as inorganic nitrogen (N) and phosphorous (P) in wastewater for their growth, with the desired results of a reduction in the concentration of these substances in the water. The aim of this review is to provide a critical account of micro-algae as an important step in wastewater treatment for enhancing the reduction of N, P and the chemical oxygen demand (COD) in wastewater, whilst utilising a fraction of the energy demand of conventional biological treatment systems. Here, we begin with an overview of the various steps in the treatment process, followed by a review of the cellular and metabolic mechanisms that micro-algae use to reduce N, P and COD of wastewater with identification of when the process may potentially be most effective. We also describe the various abiotic and biotic factors influencingmicro-algae wastewater treatment, together with a review of bioreactor configuration and design. Furthermore, a detailed overview is provided of the current state-of-the-art in the use of micro-algae in wastewater treatment. (C) 2020 The Authors. Published by Elsevier B.V.

Keywords
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Micro-algaeWastewater treatmentPollutionOrganic wasteSewageBioremediationPhotobioreactors
Keywords Plus

Wastewater Treatment

ORGANIC-CARBON SUPPLEMENTATIONALGAL-BACTERIAL CONSORTIUMGREENHOUSE-GAS EMISSIONSNITROUS-OXIDE EMISSIONSHIGH-RATE PONDSNUTRIENT REMOVALCHLORELLA-VULGARISBIODIESEL PRODUCTIONBIOMASS PRODUCTIONTREATMENT-PLANT

Wastewater Treatment

3- Recent advances in polysaccharide-based adsorbents for wastewater treatment

By:
Qi, XL (Qi, Xiaoliang) [1] ; Tong, XQ (Tong, Xianqin) [2] , [3] ; Pan, WH (Pan, Wenhao) [2] , [3] ; Zeng, QK (Zeng, Qiankun) [2] ; You, SY (You, Shengye) [2] , [3] ; Shen, JL (Shen, Jianliang) [1] , [2] , [4]
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Abstract

The existence of toxic water contaminants (heavy metals, dyes, phenols, oils, pharmaceuticals and nutrients) restricts the sustainable supply of clean water globally. Among various economic and accessible wastewater disposal technologies, adsorption is the most extensively practiced approach due to its economic, feasible and sustainable characteristics. In recent years, polysaccharides have been extensively employed for constructing adsorption materials due to their intrinsic properties including high adsorptive ability, low cost, renewability, biodegradability, biocompatibility and ease of modification. Here, a systematic review of polysaccharide-based adsorbents for wastewater treatment is given. This review is aimed at providing: (1) general design principles for polysaccharide-based adsorbents, (2) some critical factors that may affect the adsorption and (3) future directions for the development of polysaccharide-based wastewater adsorbents. Overall, this review provides guidelines on the rational fabrication and application of polysaccharide-based adsorbents, which will be beneficial to novice/expert researchers in the field of wastewater remediation. Furthermore, the authors expect that this review provokes interdisciplinary discussions that would bring a revolution to the application of polysaccharide-based wastewater adsorbents.

Keywords
Author Keywords
PolysaccharidesAdsorptionWastewater treatmentAdsorbentsPollutants
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Wastewater Treatment

HIGHLY EFFICIENT REMOVALADSORPTION CAPACITYMETHYLENE-BLUECOMPOSITE HYDROGELCELLULOSE HYDROGELCRYSTAL VIOLETHEAVY-METALSTOXIC DYESCHITOSANNANOCOMPOSITE

Wastewater Treatment

4- Critical review of advanced oxidation processes in organic wastewater treatment

By:
Ma, DS (Ma, Dengsheng) [1] , [2] ; Yi, H (Yi, Huan) [1] , [2] ; Lai, C (Lai, Cui) [1] , [2] ; Liu, XG (Liu, Xigui) [1] , [2] ; Huo, XQ (Huo, Xiuqin) [1] , [2] ; An, ZW (An, Ziwen) [1] , [2] ; Li, L (Li, Ling) [1] , [2] ; Fu, YK (Fu, Yukui) [1] , [2] ; Li, BS (Li, Bisheng) [1] , [2] ; Zhang, MM (Zhang, Mingming) [1] , [2] ;

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Abstract

With the development of industrial society, organic wastewater produced by industrial manufacturing has caused many environmental problems. The vast majority of organic pollutants in water bodies are persistent in the environment, posing a threat to human and animal health. Therefore, efficient treatment methods for highly concentrated organic wastewater are urgently needed. Advanced oxidation processes (AOPs) are widely noticed in the area of treating organic wastewater. Compared with other chemical methods, AOPs have the characteristics of high oxidation efficiency and no secondary pollution. In this paper, the mechanisms, advantages, and limitations of AOPs are comprehensively reviewed. Besides, the basic principles of combining different AOPs to enhance the treatment efficiency are described. Furthermore, the applications of AOPs in various wastewater treatments, such as oily wastewater, dyeing wastewater, pharmaceutical wastewater, and landfill leachate, are also presented. Finally, we conclude that the main direction in the future of AOPs are the modification of catalysts and the optimization of operating parameters, with the challenges focusing on industrial applications. (C) 2021 Published by Elsevier Ltd.

Keywords
Author Keywords
AOPsCombination of AOPsPrinciplesCharacteristicsOrganic wastewater treatment
Keywords Plus

Wastewater Treatment

WET AIR OXIDATIONLANDFILL LEACHATE TREATMENTFENTON-LIKE PROCESSIN-SITU GENERATIONPHOTO-FENTONAZO-DYEELECTROCHEMICAL OXIDATIONCATALYTIC OZONATIONELECTRO-FENTONAQUEOUS-SOLUTION

Wastewater Treatment

5- Application of coagulation/flocculation in oily wastewater treatment: A review

By:
Zhao, CL (Zhao, Chuanliang) [1] , [2] ; Zhou, JY (Zhou, Junyuan) [1] ; Yan, Y (Yan, Yi) [1] ; Yang, LW (Yang, Liwei) [1] ; Xing, GH (Xing, Guohua) [1] ; Li, HY (Li, Huanyu) [1] ; Wu, P (Wu, Pei) [1] ; Wang, MY (Wang, Mingyuan) [1] ; Zheng, HL (Zheng, Huaili) [3]

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Abstract

Volumes of oily wastewater are inevitably generated by every walk of life. The removal of oil particles from oil-contaminated wastewater which is characterized as huge amounts, intricate composition, and great threats to human health and the ecological environment is a research hotspot in water treatment fields. Due to high treatment costs and undesirable treatment efficiencies, oily wastewater treatment remains a topical and urgent issue. At present, coagulation/flocculation as an indispensable oily wastewater treatment technology receives much attention because it is very well established, economical, practical and relatively efficient. The influencing factors of oil wastewater treatment by coagulation/flocculation have also been summarized in-depth, like dosage, pH, etc. In consideration of its complex composition and treatment difficulty, this paper will also compare the treatment effects of different coagulants/flocculants used alone and combined effects in oily wastewater treatment: inorganic coagulants, organic synthetic polymeric flocculants, natural flocculants and modified polymeric flocculants. Additionally, in this review, the mechanisms of removing oily substance by coagulation/flocculation are emphasized. Given strict emission standards and the refractory nature of oily wastewater, the combination process with coagulation/flocculation, such as electrocoagulation, coagulation-membrane filtration hybrid process, and coagulation/flocculation-flotation can present better application potential and are discussed in this review. To provide a proper choice in practical application, the operating cost of coagulation and several conventional technologies are also compared. Finally, the existing challenges in the treatment of oily wastewater by coagulation are analyzed, and the feasible research direction is proposed.

Wastewater Treatment

Keywords

Author Keywords

Coagulants/flocculantsCoagulation mechanismDemulsificationCost estimationCombined technology

Wastewater Treatment

6- A review on conventional and novel materials towards heavy metal adsorption in wastewater treatment application

By:
Chai, WS (Chai, Wai Siong) [1] , [2] ; Cheun, JY (Cheun, Jie Ying) [2] ; Kumar, PS (Kumar, P. Senthil) [3] ; Mubashir, M (Mubashir, Muhammad) [4] ; Majeed, Z (Majeed, Zahid) [5] ; Banat, F (Banat, Fawzi) [6] ; Ho, SH (Ho, Shih-Hsin) [1] ; Show, PL (Show, Pau Loke) [2]
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Abstract

Wastewater treatment remains a critical issue globally till date despite various technological advancements and breakthroughs. Heavy metal in wastewater poses a great threat to human health if untreated properly, which makes its removal of utmost importance. Among various wastewater treatment techniques, adsorption is the most common technique to remove heavy metal in wastewater due to its flexible design, operation, and cost-effectiveness. Activated carbon being the most conventional adsorbent to remove heavy metal ion in wastewater owing to its microporous structure and ease of surface functionalization. However, the activated carbon separation from wastewater solution has been difficult and its high cost have prohibited its wide usage. Recently, the emergence of different novel materials has also showed their competitiveness in heavy metal ion removal. These promising novel materials exhibit several excellent attributes, for example large surface area, great mechanical strength, and high chemical inertness. This paper presents a brief review on the use, theory and future perspectives of conventional, as well as novel materials towards heavy metal adsorption in wastewater treatment application.

Keywords
Author Keywords
Wastewater treatmentHeavy metal removalAdsorptionConventional materialsNovel materials

Keywords Plus

AQUEOUS-SOLUTIONACTIVATED CARBONORGANIC FRAMEWORKSREMOVALBIOSORPTIONIONSPERFORMANCEGRAPHENECHROMIUM(VI)ADSORBENTS

Wastewater Treatment

7- Electrochemical advanced oxidation processes for wastewater treatment: Advances in formation and detection of reactive species and mechanisms

By:
Ganiyu, SO (Ganiyu, Soliu Oladejo) [1] ; Martinez-Huitle, CA (Martinez-Huitle, Carlos A.) [2] ; Oturan, MA (Oturan, Mehmet A.) [3]
(provided by Clarivate)

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Abstract

Over the past three decades, the knowledge of the mechanisms of electrochemical advanced oxidation processes (EAOPs) has progressively evolved with the advances in analytical and spectrometric techniques. A comprehensive understanding of the types and mechanisms of production of reactive species in EAOPs is a prerequisite to the understanding of their reactivities and elucidation of intermediate products generated during the oxidation process and degradation pathways. The type, nature, and quantity of reactive species generated in electrochemical treatment processes are controlled by many factors, including the type of the treatment technique, electrode/electrocatalyst materials, water/wastewater composition, water pH conditions, and operating parameters. Depending on the technique and operating parameters, single or multiple oxidants can be produced alone or combined electrochemical processes. However, the potency and reactivity of each oxidant are quite similar regardless of the technique, except in the case of heterogeneous and homogeneous hydroxyl radicals. This minireview presents the current state of mechanisms and models of reactive species generated in different EAOPs, highlighting different methods for their identification and reactivity.

Keywords
Author Keywords
Electrochemical oxidationReactive speciesMechanismDegradation kineticsMineralization
Keywords Plus

Wastewater Treatment

STOICHIOMETRIC TITANIUM-OXIDEHETEROGENEOUS ELECTRO-FENTONDOPED DIAMOND ELECTRODEACTIVATED PERSULFATEORGANIC POLLUTANTSCERAMIC ELECTRODEDEGRADATIONANODEEFFICIENCYPHOTOELECTROCATALYSIS

Wastewater Treatment

8- Occurrence and fate of antibiotics, antibiotic resistant genes (ARGs) and antibiotic resistant bacteria (ARB) in municipal wastewater treatment plant: An overview

By:
Wang, JL (Wang, Jianlong) [1] ; Chu, LB (Chu, Libing) [1] ; Wojnarovits, L (Wojnarovits, Laszlo) [2] ; Takacs, E (Takacs, Erzsebet) [2]

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Abstract

The occurrence and fate of antibiotics and antibiotic resistant genes (ARGs) and antibiotic resistant bacteria (ARB) in Municipal Wastewater Treatment Plants (WWTPs) worldwide were reviewed. The prevalence of antibiotics in WWTPs among different periods (1999-2009 and 2010-2019) and geographical areas (Europe, America, Asia and Africa) was summarized, analyzed and evaluated. The classes of macrolides (clarithromycin, erythromycin/erythromycin-H2O, azithromycin, roxithromycin), sulfonamides (sulfamethoxazole), trimethoprim, quinolones (ofloxacin, ciprofloxacin, norfloxacin) and tetracyclines (tetracycline) were the antibiotics most frequently detected, while bla (bla(CTXM), bla(TEM)), sul (sul1, sul2), tet (tetO, tetQ, tetW) and ermB genes were the ARGs commonly reported in WWTPs. There was a positive correlation between antibiotics and ARGs commonly detected in WWTPs, except for beta-lactam antibiotics and bla genes. The genes bla were found frequently, despite beta-lactam antibiotics were seldom detected owing to the hydrolysis. Most of antibiotics had lower levels in the period 2010-2019 in Asian countries than that in period 1999-2009 in North American and European countries. In the effluent of secondary treatment, the concentration of trimethoprim was the highest (138 ng/L in median) and the concentration of other antibiotics remained at lower than 80 ng/L, while the relative abundance of ARGs ranged 2.9-4.6 logs (copies/mL, in median). Future researches on the development of effective antibiotic removal technologies, such as advanced oxidation processes, are suggested to focus on antibiotics frequently detected and their corresponding ARGs in WWTPs.

Keywords
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Biological treatmentPharmaceuticalAntimicrobial resistanceOrganic pollutantsDisinfection

Keywords Plus

SEWAGE-TREATMENT PLANTSTANDEM MASS-SPECTROMETRYCARE PRODUCTS PPCPSFENTON-LIKE DEGRADATIONSOLID-PHASE EXTRACTIONTREATMENT SYSTEMSESCHERICHIA-COLIRISK-ASSESSMENTANTIMICROBIAL RESISTANCEPHARMACEUTICAL COMPOUNDS