Heavy Metal

1- Heavy metal pollution in the environment and their toxicological effects on humans

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Abstract

Environmental pollution of heavy metals is increasingly becoming a problem and has become of great concern due to the adverse effects it is causing around the world. These inorganic pollutants are being discarded in our waters, soils and into the atmosphere due to the rapidly growing agriculture and metal industries, improper waste disposal, fertilizers and pesticides. This review shows how pollutants enter the environment together with their fate. Some metals affect biological functions and growth, while other metals accumulate in one or more different organs causing many serious diseases such as cancer. The pharmacokinetics and toxicological processes in humans for each metal is described. In summary, the review shows the physiological and biochemical effects of each heavy metal bioaccumulation in humans and the level of gravity and disquieting factor of the disease.

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Heavy metalsSoilAirWaterAgricultural scienceEarth sciencesEnvironmental scienceFood scienceToxicology
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WASTE-WATERSEWAGE-SLUDGETOXICITYEXPOSURECADMIUMWORKERSSOILCONTAMINATIONINTERCROPSMANGANES

Heavy Metal

2- Removal of heavy metal ions from wastewater: a comprehensive and critical review

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Abstract

Removal of heavy metal ions from wastewater is of prime importance for a clean environment and human health. Different reported methods were devoted to heavy metal ions removal from various wastewater sources. These methods could be classified into adsorption-, membrane-, chemical-, electric-, and photocatalytic-based treatments. This paper comprehensively and critically reviews and discusses these methods in terms of used agents/adsorbents, removal efficiency, operating conditions, and the pros and cons of each method. Besides, the key findings of the previous studies reported in the literature are summarized. Generally, it is noticed that most of the recent studies have focused on adsorption techniques. The major obstacles of the adsorption methods are the ability to remove different ion types concurrently, high retention time, and cycling stability of adsorbents. Even though the chemical and membrane methods are practical, the large-volume sludge formation and post-treatment requirements are vital issues that need to be solved for chemical techniques. Fouling and scaling inhibition could lead to further improvement in membrane separation. However, pre-treatment and periodic cleaning of membranes incur additional costs. Electrical-based methods were also reported to be efficient; however, industrial-scale separation is needed in addition to tackling the issue of largevolume sludge formation. Electric- and photocatalytic-based methods are still less mature. More attention should be drawn to using real wastewaters rather than synthetic ones when investigating heavy metals removal. Future research studies should focus on ecofriendly, cost-effective, and sustainable materials and methods.

Heavy Metal

Keywords
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HIGHLY EFFICIENT ADSORPTIONSURFACE FUNCTIONAL-GROUPSAQUEOUS-SOLUTIONCARBON NANOTUBESCOAGULATION-FLOCCULATIONELECTRODIALYSIS PROCESSORGANIC FRAMEWORKSACTIVATED CARBONCOPPER IONSCU II

Heavy Metal

3- Soil heavy metal pollution and food safety in China: Effects, sources and removing technology

By:
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Abstract

Soil plays a fundamental role in food safety and the adverse effects of contaminants like heavy metal (loid)s on crop quality have threatened human health. Therefore, it is important to focus on the food safety and agricultural soil pollution by heavy metals, especially for China where the demand for food production is increasing. This review comprehensively introduced the current status of agricultural soil pollution by heavy metals in China, analyzed the main sources of contaminants, including the applications of pesticides and fertilizers, atmospheric deposition related to vehicle emissions and coal combustion, sewage irrigation and mining. Food safety and agricultural soil pollution by heavy metals, the removal technologies for soil remediation such as soil amendments, phytoremediation and foliar sprays were also introduced. The review can provide significant insights for policymakers, environmental engineers, and agro-technicians regarding soil contamination control and management strategies and technologies. (C) 2020 Elsevier Ltd. All rights reserved.

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Agricultural soilHeavy metalsFood safetySoil remediationPhytoextraction
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Heavy Metal

4- Effects of silicon on heavy metal uptake at the soil-plant interphase: A review

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Abstract

Silicon (Si) is the second richest element in the soil and surface of earth crust with a variety of positive roles in soils and plants. Different soil factors influence the Si bioavailability in soil-plant system. The Si involves in the mitigation of various biotic (insect pests and pathogenic diseases) and abiotic stresses (salt, drought, heat, and heavy metals etc.) in plants by improving plant tolerance mechanism at various levels. However, Si-mediated restrictions in heavy metals uptake and translocation from soil to plants and within plants require deep understandings. Recently, Si-based improvements in plant defense system, cell damage repair, cell homeostasis, and regulation of metabolism under heavy metal stress are getting more attention. However, limited knowledge is available on the molecular mechanisms by which Si can reduce the toxicity of heavy metals, their uptake and transfer from soil to plant roots. Thus, this review is focused the following facets in greater detail to provide better understandings about the role of Si at molecular level; (i) how Si improves tolerance in plants to variable environmental conditions, (ii) how biological factors affect Si pools in the soil (iii) how soil properties impact the release and capability of Si to decrease the bioavailability of heavy metals in soil and their accumulation in plant roots; (iv) how Si influences the plant root system with respect to heavy metals uptake or sequestration, root Fe/ Mn plaque, root cell wall and compartment; (v) how Si makes complexes with heavy metals and restricts their

translocation/transfer in root cell and influences the plant hormonal regulation; (vi) the competition of uptake between Si and heavy metals such as arsenic, aluminum, and cadmium due to similar membrane transporters, and (vii) how Si-mediated regulation of gene expression involves in the uptake, transportation and accumulation of heavy metals by plants and their possible detoxification mechanisms. Furthermore, future research work with respect to mitigation of heavy metal toxicity in plants is also discussed.

Keywords
Author Keywords
SiliconHeavy metalsSoilToxicitySequestration
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SUPPRESSED CADMIUM UPTAKERICE AQUAPORIN LSI1BACTERIAL COMMUNITYROOT MORPHOLOGYPOWDERY MILDEWHEALTH-RISKSIRON PLAQUEISOTOPE FRACTIONATIONVEGETABLE CONSUMPTIONLITTER DECOMPOSITION

Heavy Metal

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

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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. (c) 2021 Elsevier Ltd. All rights reserved.

Keywords

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Wastewater treatmentHeavy metal removalAdsorptionConventional materialsNovel materials
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Heavy Metal

6- Recent advances in metal-organic frameworks for the removal of heavy metal oxoanions from water

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Abstract

Due to the serious threat of heavy metal oxoanions to human health and the natural environment, their efficient removal from water contaminants has become a vital issue. Currently, adsorptive removal is one of most promising approaches to purify contaminated water. Thus, the exploration of advanced adsorption materials has attracted widespread attention. Metal-organic frameworks (MOFs) with the advantages of tunable porosity, high surface area, and abundant functional groups are superior than conventional adsorbents. Herein, this review summarizes recent progress in different MOFs as outstanding adsorbents to remove heavy metal oxoanions from water, including typical SeO32-/SeO42-, HAsO42-/H2AsO4-/H3AsO3, and CrO42-/Cr2O72-. In addition, their adsorption mechanisms are also involved, which is conducive to not only understand the adsorption process between MOFs and heavy metal oxoanion contaminants but also design new MOFs-based adsorbents with excellent performance for further research.

Keywords
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Metal-organic frameworksAdsorbentsHeavy metal oxoanionsWater treatmentAdsorption mechanisms
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ZEOLITIC IMIDAZOLATE FRAMEWORK-8HIGHLY EFFICIENT REMOVALANION-EXCHANGECOORDINATION POLYMERSHEXAVALENT CHROMIUMAQUEOUS-SOLUTIONADSORPTIVE PERFORMANCESELECTIVE ADSORPTIONFUNCTIONAL-GROUPSOXYGEN VACANCIES