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ترجمه کتاب ☐

یک بررسی در مورد تکنیک‌های کارآمد برای حذف فلزات سنگین سمی از محیط آبزی

چکیده

بحث و جدال حول محور آلودگی محیط زیست در زندگی بشر و در سیستم زیست محیطی در حال افزایش است. به خصوص، آلودگی آبی که به دلیل تخلیه فاضلاب از صنایع به محیط آبزی به سرعت در حال رشد است. تنها راه برای یافتن منبع جدید آب استفاده مجدد از فاضلاب تصفیه شده است. چندین فن آوری درمانی برای این کار موجود است که سهولت استفاده مجدد از فاضلاب بازیافت شده را فراهم می‌کند. فلزات سنگین مانند روی، مس، سرب، نیکل، کادمیوم، جیوه و غیره بر اساس سمیت (میزان سمی بودن) آنها به مشکلات مختلف محیطی اضافه می‌کنند. این فلزات سمی در معرض انسان و محیط قرار دارند. تجمع یون‌ها که اتفاق می‌افتد، خطرات جدی برای سلامتی و محیط زیست ایجاد می‌کند. از این رو، این یک نگرانی عمده در محیط زیست است. به دلیل این نگرانی، اهمیت توسعه فناوری برای حذف فلزات سنگین افزایش یافته است. این مقاله به این طرح جدید با دو هدف کمک می‌کند. ابتدا، طرحی از فناوری‌های تصفیه و به دنبال آن ظرفیت جذب فلزات سنگین از پساب‌های صنعتی فراهم می‌کند. عملکرد رویه، ظرفیت بازسازی آنها و اثرات احتمالی زیست محیطی و بهداشتی در این مقاله بررسی شده است. سرانجام، این مقاله اطلاعات مربوط به روش‌های مهم گنجانیده شده در مطالعاتِ در مقیاس آزمایشگاهی را که برای شناسایی تصفیه فاضلابِ عملی و راحت لازم است، ارائه می‌دهد. علاوه بر این، تلاش شده است تا تأکید بر ترسیب فلزات سنگین از پساب صنعتی و ایجاد زمینه علمی برای کاهش تخلیه فلزات سنگین در محیط ایجاد شود.

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Efficient techniques for the removal of toxic heavy metals from aquatic environment: A review

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ABSTRACT

The controversy related to the environment pollution is increasing in human life and in the eco-system. Especially, the water pollution is growing rapidly due to the wastewater discharge from the industries. The only way to find the new water resource is the reuse of treated wastewater. Several remediation technologies are available which provides a convenience to reuse the reclaimed wastewater. Heavy metals like Zn, Cu, Pb, Ni, Cd, Hg, etc. contributes various environmental problems based on their toxicity. These toxic metals are exposed to human and environment, the accumulation of ions takes place which causes serious health and environmental hazards. Hence, it is a major concern in the environment. Due to this concern, the significance of developing technology for removing heavy metals has been increased. This paper contributes the outline of new literature with two objectives. First, it provides the sketch about treatment technologies followed by their heavy metal capture capacity from industrial effluent. The treatment performance, their remediation capacity and probable environmental and health impacts were deliberated in this review article. Conclusively, this review paper furnishes the information about the important methods incorporated in lab scale studies which are required to identify the feasible and convenient wastewater treatment. Moreover, attempts have been made to confer the emphasis on sequestration of heavy metals from industrial effluent and establish the scientific background for reducing the discharge of heavy metals into the environment.

1. Introduction and scope

Today, the environmental importance of water is considered as basic necessary everywhere in the world. The primitive requirement for human livelihood is water. The serious environmental burden is rising due to the water contamination and water insufficiency and its limited availability is increasing nowadays due to the destruction of natural water supports. This makes the reduction in the development of economic status, human sustenance and environment [1]. Environmental protocols were changed in the past few years to diminish the water pollution [2]. Due to the rapid rise of urbanization, climatic change, utilization of natural resources and food requirement, around 40% of the population are facing the water scarcity issues [3]. The utilization of fresh water for agricultural and industrial purposes are growing which results in water demand. This concern can be solved using reclaimed wastewater is a recent authority for water supply [4]. But this authority is based on the updated wastewater regulations. Though, the reclaimed water plays a major in reducing the above-mentioned issues, certain health effects can occur due to the presence of pathogenic organisms, endocrine disrupting chemicals (EDC), pharmaceutical products, personal care products (PCP), organic compounds in it [5–7]. This review paper attempts to devote the summary of treatment technologies available for the sequestration of heavy metals from the industrial effluent. The main intention is to provide useful information about the most relevant features of the removal methods and to give a sketch of several studies. Based on this topic we have categorized the treatment practices into seven techniques. They are coagulation/flocculation, ion exchange, flotation, membrane filtration, chemical precipitation, electrochemical treatment, and adsorption. This paper gives the brief view on the research studies about the merits and demerits of treatment methods. The current review article also deals with the critical issues and health effects about the heavy metals. We have incorporated the recent studies in this review based on the heavy metal elimination using different techniques.

1.1. Wastewater

The disposal of highly polluted wastewater is rising during the past