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Amorphous adsorbent from geothermal solid waste for methylene blue removal

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Abstract

Organic compounds such as dyes and heavy metal ions are common pollutants in waste water that have become a global problem. Adsorption has proven to be a successful technique in removing organic species such as methylene blue (MB). Geothermal solid waste has the potential to be used as an adsorbent due to its silica content. The silica compound in geothermal waste has the potential to be developed as porous material. Aluminium hydroxide and geothermal solid waste were added to the aqueous alkali (sodium hydroxide (NaOH)) in a continuous stirred-tank reactor, which resulted in an amorphous mesoporous material of the natrolite phase. The performance of the geoadsorbent was evaluated through the removal of various concentrations of MB, and isotherm adsorption models were used to evaluate the data. The adsorption mechanisms of MB removal by the geoadsorbent as shown by Fourier transform infrared spectra are electrostatic attraction and hydrogen-bond formation. The geoadsorbent can remove MB up to 84.449%, in which the adsorption is highly dependent on the initial concentration of MB. The Langmuir isotherm model provides the most accurate representation of MB adsorption as a result of the physical process, with a correlation coefficient of 0.971. © 2023 Proceedings of the Institution of Civil Engineers: Civil Engineering. All right reserved.

Author keywords

adsorption; methylene blue

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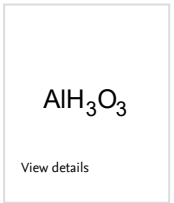

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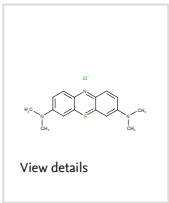

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Assessment of toxicity and electrochemical sensing of arsenic in aqueous sources

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Abstract

A variety of contaminants present in potable water, including heavy metals, cause numerous health hazards. Arsenic (As) is studied as one of the chief heavy elements hazardous to human beings and other categories of life. Arsenic as a natural constituent of the earth's crust is present in mineral rocks, which are deposited through various natural processes. Moreover, arsenic is also added to groundwater anthropogenically through the burning of fossil fuels, arsenical agrochemicals, wood preservatives and so on. Arsenic (III) (As^{III}) and arsenic (V) (As^{V}) are toxic inorganic forms in aqueous solution and are responsible for cancer, arsenicosis, vascular diseases and toxicity related to genes, cells, epidemiology and so on. In view of these problems, it is necessary to detect and decontaminate arsenic contamination in potable water. In this paper, brief descriptions are given of the most significant electrochemical methods, due to their advantages such as robustness, speed, accuracy and simplicity. Moreover, techniques such as differential pulse voltammetry, square-wave voltammetry (SWV), stripping chronopotentiometry, anodic stripping voltammetry and cyclic voltammetry (CV) have kept the electrochemical method as a diverse and advanced technique for the sensing process. Furthermore, details of the determination and decontamination of arsenic in potable water through an electrochemical process with a particular focus on SWV and CV are discussed.

Keywords: arsenic cyclic voltammetry decontamination electrochemical method ground water heavy metals ... Show All

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The effect of soil types on the phytoremediation of heavy metals by *Phragmites australis*

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Abstract

The remediation of heavy metals from contaminated sites by the application of phytoextraction is proving to be efficient and cost-effective. A pot experiment was conducted to ascertain the effect of soil types (sand, loam and clay) in the remediation of copper (Cu), chromium (Cr) and mercury (Hg) using *Phragmites australis*. The results obtained throughout 60 days of plant growth showed that the copper absorption in the roots of the plant in sandy, loamy and clayey soils was 47, 79.1 and 96 mg/kg, respectively. Chromium absorption in the roots of the plant in sandy, loamy and clayey soils was 136, 180 and 353 mg/kg, respectively, while mercury absorption in sand, loam and clay was 11.7, 14.8 and 19.3 mg/kg. The translocation factor for all metals in the three soil types was less than 1; however, the bioaccumulation factor in all cases was more than 1. The study concluded that the accumulation of chromium in the tissues of the plant was more pronounced than those of copper and mercury. Clayey soil proved to be the favourable soil required for the effective remediation of the metals into the tissues of a plant.

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